IMPERIAL BUREAU OF MYCOLOGY
17 MAY 1924

PENNSYLVANIA
Department of Agriculture
HARRISBURG, PA.
FRED. RASMUSSEN, Secretary of Agriculture

Vol. 5 November, 1922 No. 8

General Bulletin, No. 371

The Cigar Tobacco Industry In Pennsylvania

BY

WILLIAM FREAR, Ph. D.
E. K. HIBSHMAN, B. S.
OTTO OLSON

Entered as second class matter, March 22, 1918, at the Post Office at Harrisburg, Pa., under the Act of June 6, 1900. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized on June 29, 1918.

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DOCTOR WILLIAM FREAR

In 1892 the Lancaster County Tobacco Growers' Association was formed and this same year marked the beginning of tobacco investigations under the direction of The Pennsylvania State College. Doctor William Frear, as Vice Director of the Pennsylvania Experiment Station, was placed in direct charge of the experiments and during thirty years of continuous service he became intimately acquainted with the growers, not only in Lancaster but in all the tobacco growing counties of the State.

During these thirty years the experiments covered a wide field of studies. Very ably and carefully Doctor Frear conducted investigations which have given to the tobacco growing industry a great deal of valuable information concerning fertilization, crop rotations, curing, growing of shade wrappers, improvement of the filler type, breeding, seed bed sterilization, plant diseases and cultural methods. Careful laboratory tests have developed many valuable facts about the composition of the tobacco leaf and the consequent effect upon the quality of the cigar filler t bacco.

Doctor Frear was always a most welcome visitor at the meetings of the growers and on a number of special occasions was presented with tokens of their appreciation. Through his faithful service, cheerfully rendered, he won the everlasting esteem of the people he served. It is to his memory and in appreciation of his work, that this booklet which he helped plan and write, is dedicated.

LETTER OF TRANSMITTAL

Harrisburg, January 15, 1923.

Hon. William C. Sproul,
Governor of Pennsylvania,
Harrisburg, Pa.

To His Excellency:

I have the honor to transmit for your consideration and approval a report on the cigar tobacco industry in Pennsylvania.

This report has been made possible through the joint effort of the Pennsylvania Department of Agriculture, the Pennsylvania State College, and the United States Department of Agriculture. Special acknowledgement is due Dr. William Frear and Mr. E. K. Hibshman, of State College, Pa., and Mr. Otto Olson and Dr. W. W. Garner of the Bureau of Plant Industry of the United States Department of Agriculture, for their valuable services in compiling the material for this bulletin.

This report is the second of the series on Pennsylvania agricultural resources and will be followed by others as rapidly as finances will permit.

Respectfully yours,

FRED RASMUSSEN,

Secretary of Agriculture.

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THE CIGAR TOBACCO INDUSTRY IN PENNSYLVANIA

By

William Frear, Ph. D., E. K. Hibshman, B. S., and Otto Olson.

HISTORICAL SKETCH

This account is intended to bring together the available facts relating to the history of the culture, its development, its present extent, its locally practiced methods, and its agricultural, manufacturing and financial relations.

According to early European observers, tobacco was cultivated, in the sixteenth century, from the region of the St. Lawrence river to that of the Orinoco and the Amazon. The pipes recovered from the deposits of the mound-builders show a long age for the aboriginal practice of pipe-smoking. This was the principal non-medicinal use of the leaf. In Brazil however, it was rolled in wrappers formed from the thin, inner husks of maize, and smoked in this cigar form. Its use also in the form of snuff was well known.

At that time, the principal species used in North America was *Nicotina rustica*, with a greenish-yellow flower; whereas in more southerly regions, the use of *N. tabacum*, with a pinkish flower, prevailed. The latter species is now used almost universally for American culture. The genus *Nicotina* forms part of the great Nightshade family, which includes the useful food-plants, the tomato and the potato, as well as the medicinal plants, belladonna, henbane and stramonium.

The quick development of commercial tobacco culture in the Jamestown colony is familiar to all school children; likewise the extensive growing of tobacco as an article of commerce in Maryland; but much less is recorded about the early extension of the culture north of those colonies. The promoters of colonial settlements confidently expected that a profitable tobacco export trade would be established from the more northerly portions of the Atlantic border. According to DeVries[1], the Dutch West India Company, on Dec. 12th, 1630, sent over a lot of settlers to conduct a whale fishery near the mouth of the Delaware and on the lands bordering that river to grow tobacco for export; likewise, Peter Minuit, after serving as governor of the Dutch colony, helped to promote a Swedish colonization company one of whose avowed objects was tobacco cultivation and export. The Swedish settlement, which landed on the

1. Egle, William H.: History of the Commonwealth of Pennsylvania, 3d Ed., p. 3.

west bank of the river, held its ground and slowly spread through that region, but little is heard of its culture of the tobacco plant. The colonists brought over by Penn in 1682 gave much attention to this culture and, it is said, in 1689 shipped fourteen cargoes of the leaf from Philadelphia; but the culture for commercial purposes soon languished and disappeared.

The use of tobacco for chewing, snuff-taking and pipe-smoking was general throughout the Commonwealth, even the women among the pioneers frequently using the solace of the pipe. How much of the tobacco thus consumed was locally produced is unknown. In the 60's of the last century, the farmer often grew a few stalks of tobacco in a garden row, cured it by hanging it in his barn rafters, and used it, without sweating, in the form of a rough twist for chewing and pipe-smoking; but this was after the commercial culture of cigar tobacco had been widely extended through the State. According to some accounts, tobacco continued to be grown in a small way during the first half of the nineteenth century in the region having Lancaster as a center. It may, however, be significant of the commercial unimportance of the culture in the last of the eighteenth century, that so comprehensive a work as John Spurier's "Practical Farmer" (Wilmington, 1793) does not mention tobacco. Likewise, a manuscript history written about 1835 by the Rev. Joseph Matthias, of New Britain, Bucks County, which describes the people, customs, and the clearing, planting and management of the land in a rural community near Philadelphia during the period, 1700 to 1835, fails to make any mention of tobacco.

Cigars were not at all generally used in the American colonies, but were largely produced in the West Indies shortly after the settlement of these islands. The trade, ofttimes illicit, between these islands and the colonies was always quite extensive, and West Indian cigars were quite well known at the points of import. It is true that Alexander Hamilton,[1] in his famous 'Report on Manufacturers', Dec. 1791, to the House of Representatives, speaks of the manufacturers of snuff, chewing and smoking tobaccos as regularly established trades in America, rather than as articles of household production. But his reference to smoking tobaccos is doubtless to those fitted for pipe-smoking, rather than to cigars.

New England was the birth-place of the modern American cigar. Tobacco culture began there immediately after the settlement of the region. A law of 1640 forbade the use of any but home-grown tobacco, and other measures discouraged such use. Nevertheless, small crops were continuously grown in the Connecticut Valley throughout the seventeenth and eighteenth centuries. According to

1. Special Report on the Establishment of a National Bank, Finances, Manufactures, and a Mint: Philadelphia, Wm. McKean, 1821, p. 210.

DeVault[1], in no period prior to 1801 did the annual production exceed 20,000 pounds. The first American cigar was made in 1801 by Mrs. Prout, the wife of a farmer of South Windsor, Conn. The wives of other farmers joined Mrs. Prout in her enterprise, and peddled cigars from village to village by wagon. The "Long Nines" and the "Windsor Particulars" soon came to be the principal brands. In 1810, the first cigar factories were established at East Windsor and Suffield; and in 1825, the first tobacco warehouse was built at Warehouse Point, Conn., at which 3,200 pounds were packed for shipment to New York. By 1840, tobacco had become a general crop in Connecticut valley, though the crops were much less than those of to-day.

It is noteworthy that the first Congress, after the adoption of the federal constitution, established a protective tariff. Dr. Edward Young[2] in his history of American tariff legislation, states that under the Act of July 18, 1789, while other tobacco products were subjected to a duty, 'segars' bore with other products not specifically mentioned, a duty of six cents a pound. By the Act of March 26-27, 1804 a duty of $2.00 a thousand was placed upon 'segars'. Whether this increase was intended as a luxury tax or to protect the infant industry of cigar manufacture is not clear.

The thin, elastic leaf grown on the sandy and gravelly soils of the Connecticut Valley was well fitted for use as cigar wrappers and binders. After the cigar-making industry was well started, the culture of cigar tobaccos started in other suitable areas. By the middle of the nineteenth century, this culture had become well established in the Miami valley of Ohio, the Gadsden area of Florida, the Onondaga and Big Flats areas of New York, and also in certain areas of Pennsylvania; and, beginning about 1870, it spread very rapidly in southern Wisconsin.

The Pennsylvania developments are of chief interest in this connection. The facts now available do not equally represent all the principal areas in which tobacco culture is, at present, of considerable importance. The York-Lancaster area is probably the seat of the earliest attempts at commercial culture, but few authentic facts concerning its origin and rise in York County have been found. For an account of the early Lancaster developments, we are indebted to the veteran editor, local historian and tobacco economist, Frank R. Diffenderfer, Litt. D., Compiler of the Lancaster County tobacco history for the Tenth Census (U. S.), and author of numerous other reports upon the subject. He states that, from the accounts of persons still living in 1879, tobacco was grown, as early as 1828, by several farmers near Ephrata. They sometimes obtained a second

1. Massachusetts Agr'l. Expt. Station. Bulletin 193, Oct. 1919.
2. Report on Customs-Tariff Legislation: Gov't. Printing Office, 1874.

crop in a single season, and used this product exclusively for cigar fillers. The tobacco produced was rolled into cigars for the grower's use, but a surplus was made which was sold to the country stores at the rate of four or five for one cent. Dr. Diffenderfer was born in 1833 near what is now the borough of New Holland. There, about 1843, a cigar-maker named Bachmann grew annually an acre or two of tobacco which he made up into cigars for sale at three

Fig. 1. Lancaster County Landscape.

fips or $18\frac{3}{4}$ cents a hundred. No other fields of tobacco were at that time grown within an area of twenty five square miles in that south-eastern portion of the county. Yet, in 1839, there must have been in Lancaster County a tobacco acreage of thirty to forty acres, to yield the product reported in the census of that year, when York Lancaster, Dauphin, Northumberland, Westmoreland and Fayette Counties all reported yields of 10,000 pounds and upwards.

According to the recollections of the veteran grower, Mr. John Quiggle[1] of McElhattan, the first tobacco grown on a commercial scale in Clinton County was grown by Thomas Pelton, a 'Connecticut Yankee', in 1845 on the Barr lot, of three-fourths acre area, in the village of Liberty, now called 'Island'. The variety grown was Connecticut Broadleaf. The tobacco was cured in a stable, the stalks being fastened to poles by twine. The stripped leaf, tied in large hands, unsized, was shipped to Philadelphia by the Pennsylvania canal, and sold through a commission merchant at 8 cents a

1. The accounts given by Messrs. Quiggle and Shaw were communicated through the courtesy of Mr. Ernest Moran, Secretary of the Clinton-Lycoming County Tobacco Growers Association.

pound. In 1847, Pelton grew two acres of the same variety for Mr. David Baird, also of Liberty. For this crop a crude shed was constructed by planting poles, connecting them by cross-ties spiked on, roofed with "penny boards', and when the crop had been hung on the framework, closed on the sides by pine-trees, cut and leaned against the structure. The 1847 crop was marketed just like that of 1845. The first crop of Havana Seed tobacco was grown on Great Island in 1881, on the farm of Mr. Henry McCormick, the seed having been obtained from Wisconsin.

According to Mr. George Shaw, John Rhinearson, a native of Lancaster County, grew the first crop of tobacco in Lycoming County, on the Martin farm, in 1849. The tobacco was cured in like manner with that grown on the Baird place, in Clinton County, save that the sides of the curing shed, like the roof, were made of 'penny boards'. In 1850, Mr. Shaw grew his first crop of Broadleaf, which he sold to Mr. Baird at 5 cents a pound.

The growing on a commercial scale of tobacco on the bottom lands, and sometimes on the hillsides of Bradford and Tioga Counties, is due to a southerly development of the Big Flats of southern New York. In this part of the Chemung River Valley, including portions of Chemung, Steuben and Tioga Counties (N. Y.), tobacco

Fig. 2. York County Landscape.

had been grown by pioneers for their own use as early as 1646[1], but Sanford Elment, of Big Flats, who in 1851 grew a crop of six acres, is supposed to be the first extensive or commercial grower in southern New York. Before 1878, the Connecticut Seedleaf or Broadleaf was exclusively grown; but since that time, Domestic Havana and hybrids of the two varieties have displaced the Broadleaf in

1. First Annual Report, N. Y. Agr'l. Expt. Station, Geneva, 1820, P. 148 seq.

this area, and in the Pennsylvania regions outlaying. Most of this region sells its crop to warehouses in Elmira and Binghamton.

The foregoing historical fragments from a few of the tobacco localities now most prominent in the State, serve to make clear the comparatively recent development of tobacco production upon a commercial scale in Pennsylvania. The broad outlines of this development are more fully exhibited in the statistical records.

PRODUCTION

Statistics of Pennsylvania Cigar tobacco Production.

The tables immediately following show, (1) the officially recorded production of tobacco in the several counties of the State at ten-year intervals from 1839 to 1919, both inclusive; and (2) the acreage devoted to this crop at the ten-year intervals from 1879 to 1919.

The returns of the national census did not include items of agricultural production until the Seventh Census, of 1849. The figures for 1839 were gathered and published for 1839 by the Agricultural Department of the Patent Office. No separate figures for the acreages devoted to this crop by the counties of Pennsylvania were published in the Census reports until the Tenth Census, for 1879.

TABLE 1—TOBACCO PRODUCTION IN PENNSYLVANIA BY COUNTIES.

From U. S. Census Returns (Pounds of Cured Leaf).

Counties.	1839	1849	1859	1869	1879	1889	1899	1909	1919
Adams,			300	925	56,107	16,649	3,700	25,944	8,004
Allegheny,		72	325		2,360	750		40	5
Armstrong,					2,730	405	20	195	
Beaver,		1,680	250		2,627	30	600	25	
Bedford,					3,793	205		475	240
Berks,		200	32,435	1,000	240,027	66,026	94,640	199,681	170,699
Blair,									
Bradford,					173,142	538,179	1,693,820	328,753	68,850
Bucks,	15		15,268	151,372	1,160,970	325,280	71,770	2,291	2,000
Butler,			124	67	4,224	115	40	180	30
Cambria,			30		2,454		30	60	
Cameron,					6,550				
Carbon,			300						45
Centre,					27,733	7,410	50		3,663
Chester,	20		1,217	2,400	633,632	679,625	339,490	552,193	941,217
Clarion,				25	454	20			
Clearfield,					450			90	100
Clinton,			81,230	36,169	993,401	510,041	1,221,730	332,364	73,667
Columbia,			5,810		3,196			100	
Crawford,			215	124	3,297	1,401	80	100	
Cumberland,		200	12,095	900	448,118	94,935			
Dauphin,	46,730	50,200	99,270	44,303	614,362	116,510	37,020	109,936	107,120
Delaware,			4		12,347				
Elk,					1,347	50			
Erie,		8,000	10,390		2,730		3,000		200
Fayette,	7,140		645	142	5,575	20	10	1,350	45
Forest,				40	283		220		
Franklin,					68,605	65			130
Fulton,			2,300		3,172		30	75	107
Greene,		2,250	9,589	15	7,333			406	1,590
Huntingdon,		7,000	580		14,045	415	200	150	135
Indiana,				230	10,181	5	70		
Jefferson,					1,378		30	26	
Juniata,					80,609	40,824	80,140	46,278	29,711

TABLE 1—TOBACCO PRODUCTION IN PENNSYLVANIA BY COUNTIES.—Continued.

Counties.	1839	1849	1859	1869	1879	1889	1899	1909	1919
Lackawanna,					503		20		
Lancaster,	48,860	378,050	2,001,547	2,692,584	23,946,326	19,217,800	28,246,160	36,892,869	49,335,407
Lawrence,				190	1,080		40	3,000	
Lebanon,			1,804	131	703,488	275,869	277,070	405,669	521,232
Lehigh,	4,000		12,429	500	35,620	6,000	30		2,575
Luzerne,		1,000	550		35,736	2		20	173
Lycoming,			35,908	2,200	463,686	134,701	227,350	107,561	173,300
McKean,					335		200		100
Mercer,					4,110	160	60	37	324
Mifflin,			700	370	55,025				
Monroe,		20	400		425		20		
Montgomery,		100	4,827	50	20,930		350	7,210	2,156
Montour,			1,030		58,179	4,700			1,015
Northampton,			9,037	50	4,073		620		3,152
Northumberland,	27,305	23,552	52,959	3,700	539,541	152,700	133,380	16,025	10
Perry,			4,250	250	49,120		10	1,205	5,013
Philadelphia,	1,800	3,500	26,030		49,000				
Pike,					513		2,380	140	
Potter,			1,527	279	2,872	1,800	23,290		
Schuylkill,			170		6,746				
Snyder,			3,837		115,960	1,500	6,170		15,510
Somerset,				995	906		10		7
Sullivan,					470		4,030		20
Susquehanna,			1,609		1,530	50	500		
Tioga,			2,390		292,198	498,752	2,812,330	845,957	245,327
Union,	8,000		10,700		109,414	8,700	50	2,500	240
Venango,		300	875	100	421		500		
Warren,		2	386		730			572	
Washington,			1,607	75	2,065	30		32	555
Wayne,				100	783		540		
Westmoreland,	18,400	17,970	390	445	62,096		20		76
Wyoming,			39,000		39,875	26,665	55,360		
York,	162,748	418,555	695,405	527,808	5,753,766	6,228,107	6,167,490	6,281,294	4,252,101
State,	325,018	912,651	3,181,586	3,467,539	36,943,273	28,956,247	41,502,620	46,164,800	55,965,851

TABLE II.

TOBACCO ACREAGE IN PENNSYLVANIA. BY COUNTIES.

From U. S. Census Returns.

Counties.	1879	1889	1899	1909	1919
Adams,	58	12	4	23	9
Allegheny,	6	1			
Armstrong,	5	1	(1)		
Beaver,	5	(1)	1		
Bedford,	4	(1)		1	1
Berks,	230	100	85	216	206
Blair,					
Bradford,	132	371	1,210	278	60
Bucks,	934	330	60	2	2
Butler,	5	(1)	(1)		
Cambria,	5		(10)		
Cameron,	7				
Carbon,					
Centre,	22	6	(1)		5
Chester,	487	718	268	490	785
Clarion,	1	(1)			
Clearfield,	1			1	
Clinton,	680	425	812	355	68
Columbia,	21				
Crawford,	6	2	(1)		
Cumberland,	346	90			
Dauphin,	547	116	30	104	96
Delaware,	11				
Elk,	2	(1)			
Erie,	4		3		
Fayette,	8	(1)	(1)	2	
Forest,	1		(1)		
Franklin,	77	(1)			
Fulton,	4		(1)		
Greene,	12				2
Huntingdon,	12	1	(1)		
Indiana,	15	(1)	(1)		
Jefferson,	2		(1)		
Juniata,	78	35	69	35	23
Lackawanna,	2		(1)		
Lancaster,	16,992	18,007	18,025	32,783	37,301
Lawrence,	3		(1)	18	
Lebanon,	624	280	286	416	466
Lehigh,	31	9	(1)		6
Luzerne,	29	(1)			
Lycoming,	319	126	276	97	129
McKean,	1		(1)		
Mercer,	9	(1)	(1)		1
Mifflin,	49				
Monroe,	1		(1)		
Montgomery,	16		1	5	2
Montour,	61	4			2
Northampton,	8		1		2
Northumberland,	488	157	107	15	
Perry,	52		(1)	1	4
Philadelphia,	52				
Pike,	2		(1)		
Potter,	4	3	22		
Schuylkill,	9				
Snyder,	98	3	9		14
Somerset,	2		(1)		
Sullivan,	1		3		
Susquehanna,	2	(1)	1		
Tioga,	284	457	1,785	761	181
Union,	90	10	(1)	3	1
Venango,	1		1		
Warren,	1			2	

Counties.	1879	1889	1899	1909	1919
Washington,	3	(1)			1
Wayne,	2		1		
Westmoreland,	54		(1)		
Wyoming,	35	21	38		
York,	4,567	5,669	4,662	6,134	3,432
State	27,566	26,955	27,760	41,742	42,799

Considering the State as a whole, tobacco production during the Census years has shown a remarkable growth since its inception on a commercial scale.

Year.	*Pounds of cured leaf.*
1839	325,018
1849	912,651
1859	3,181,586
1869	3,467,539
1879	36,943,273
1889	28,956,247
1899	41,502,620
1909	46,164,800
1919	55,984,791

That is, the production in 1919 was over one hundred and seventy times as great as in 1839, when it was just beginning to assume commercial proportions.

During the period of this development, Blair is the only county for which no tobacco product is reported for any census year. In many localities, however, the culture has never assumed commercial importance. For the counties of Carbon, Clarion, Clearfield, Forest, Lackawanna, McKean, Monroe, Pike, Somerset, Venango, Warren and Wayne, no census year shows a production of 1,000 pounds. That is, in one-fifth of the counties the production never rose to commercial proportions.

The State-wide progress has shown several marked stages of advancement. The production multiplied three-fold in the 40's; and again three-fold in the 50's. During and after the Civil War, in the 60's, little gain appeared; but in the 70's production increased to nearly eleven times the volume of the 60's. Since then, the advance has been more gradual, with a distinct falling off in 1889, followed by fairly steady gains until 1919, when the product was about one-half more than in 1879.

The distribution in the production in the several counties of the Commonwealth has, however, shown quite remarkable shifts. In 1839, York County produced one half of the crop reported for the State;

with Lancaster, Dauphin and Northumberland following far behind, but next in importance. Westmoreland, Fayette, Union, Lehigh and Philadelphia reported from 1,000 to 20,000 pounds each.

By 1879, the culture had reached its widest expansion. In that year, Blair and Carbon were the only counties reporting no crop and from all but twelve other counties, yields of more than 1,000 pounds were returned. The following counties each reported the production of 150,000 pounds or more, stated in their relative order of production.

County.	*1879 crop. Pounds.*
Lancaster,	23,946,326
York,	5,753,766
Bucks,	1,160,970
Clinton,	993,401
Lebanon,	703,488
Chester,	633,632
Dauphin,	614,362
Northumberland,	539,541
Lycoming,	463,686
Cumberland,	448,118
Tioga,	292,198
Berks,	240,027
Bradford,	173,142

Since that time, tobacco-growing has become far more localized, the following counties, only, reported yields in excess of 150,000 pounds in 1919:

County.	*1919 crop. Pounds.*
Lancaster,	49,335,407
York,	4,252,101
Chester,	941,217
Lebanon,	521,232
Tioga,	245,327
Lycoming,	173,300
Bucks,	170,699

Only five other counties report production for that year in excess of 10,000 pounds.

Lancaster county, which now produces about nine tenths of the entire State yield, has led the progress in actual yield and in proportion of the entire production for Pennsylvania shown in the following diagram.

TABLE III.

LANCASTER COUNTY AND STATE PRODUCTION.

Year	State Pounds.	Lancaster Co. Pounds.	Lancaster Co. %
1839	325,018	48,860	15.0
1849	912,651	378,050	41.4
1859	3,181,586	2,001,547	62.9
1869	3,467,539	2,692,584	77.7
1879	36,943,273	23,946,326	64.8
1889	28,956,247	19,217,800	66.4
1899	41,502,620	28,246,160	68.0
1909	46,164,800	36,892,869	79.9
1919	55,984,791	49,335,407	88.1

The culture has increased in Lancaster County, but not uniformly in the adjacent counties, for which Lancaster city warehouses and brokerage organizations serve as a business center. York County produced its maximum of somewhat more than six million pounds in 1889-1909, but fell to about four million in 1919. Chester, on the other hand, gave its largest product in 1919. Bucks in 1919 gave only two-thirds as much as in 1879, altho the extent of the culture in that county has been quite variable from the beginning. In Dauphin, the 1919 yield was similar to those of 1889 and 1909, but little more than one-sixth of the 1879 production. The Lebanon production, after the fall-off in the 80's, has increased during the present century, but the 1919 crop is only about five-sevenths of the 1879 production.

The Bradford-Tioga district, which is a southwest extension of the Big Flats area of New York, and shares the vicissitudes of its market, has moved quite independently of the Lancaster variations, and, until the last decades, the two counties have produced in fairly parallel quantities.

Production of the Bradford-Tioga District (Pounds).

	1879	1889	1899	1909	1919
Bradford, ...	173,142	538,179	1,693,820	328,153	68,850
Tioga, ...	292,198	498,752	2,812,330	845,957	245,327
Combined, ...	465,340	1,036,931	4,506,150	1,174,110	314,177

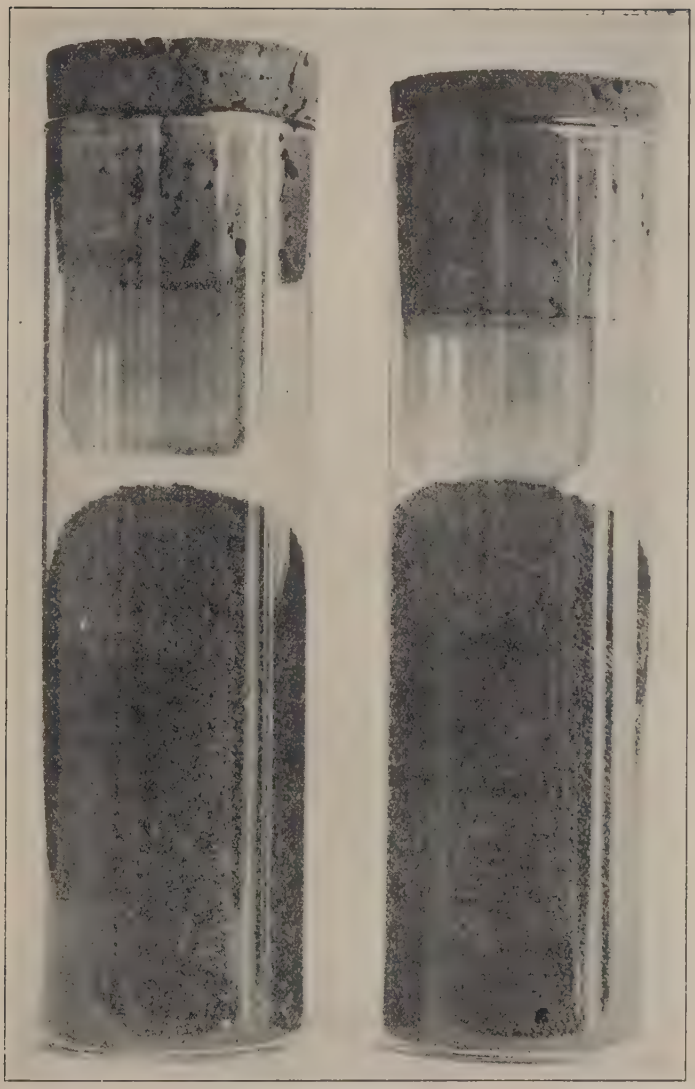

Fig. 3. Tobacco Seed Magnified One and One-half Times. Seed in Bottle on the Right Has Been Cleaned and the Light Immature Seed Removed.

In this district, the culture increased through the 80's and 90's, so that in 1899, the production was ten-fold that of 1879; but since then has decreased as steadily and as rapidly, so that the 1909 pro-

duction was about on a par with that of 1889, and that of 1919 even less than that of 1879.

The river counties of the North Branch of the Susquehanna river constitute another district area. The production figures for this district exhibit some of the features of both the Lancaster and the Bradford-Tioga districts.

Production of North Branch Counties (Pounds).

	1879	1889	1899	1909	1919
Centre, ...	27,733	7,410	50	.....	3,663
Clinton, ...	993,401	510,041	1,221,730	332,364	73,669
Lycoming, ...	463,686	134,701	627,350	107,561	173,300
Northumberland	539,541	152,700	133,380	16,025	10
Union, ...	109,414	8,700	50	2,500	240
	2,133,775	813,552	1,988,160	458,450	250,882

The production of 1889 showed, like that of Lancaster, a distinct sag, but came back in 1899 almost to the 1879 level; but fell off rapidly during the present century. Centre and Union counties ceased to be commercially important after 1879, Northumberland after 1889. The high production period for the two counties remaining, Clinton and Lycoming, included 1899, just as did that of the Bradford-Tioga district, which produced similar tobaccos. These up-river counties never established a satisfactory tobacco market.

In 1879, Cumberland and Franklin counties, covering the lower area of the Great Valley, locally Cumberland Valley, which is noted for its general fertility, together produced about 500,000 pounds of tobacco, but the culture ceased in Franklin county immediately thereafter, and in Cumberland county ten years later.

The area of the Juniata Valley gave a very considerable production in 1879, but of the counties forming that area, Juniata alone has continuously maintained the culture, though on a diminishing scale, being in 1919 not much more than one-third as much as in 1879 and 1899, when the county yield was upwards of 80,000 pounds.

In 1839, the south-western counties, Fayette and Westmoreland, especially the latter, contributed important amounts to the State's production, but during the next thirty years, the culture dwindled, to revive sharply in the 70's. Since 1879, the culture has almost ceased in this district.

The reason for these shifts of production is complex. It is not primarily any greatly superior productiveness of the localities in which the culture persisted and expanded. This is manifest from a consideration of the acre yields reported for the census years, computed from the data of Tables I and II foregoing. To diminish the errors in statement of the areas under the culture, which are relatively large when small areas only are involved, those data alone

which represent an annual yield of 10,000 pounds or more for the county, have been used.

TABLE IV.

ACRE YIELDS (Pounds).

Counties.	1879	1889	1899	1909	1919
Adams,	967	1,387		1,128	
Berks,	1,044	660	1,114	924	829
Bradford,	1,312	1,151	1,400	1,183	1,147
Bucks,	1,243	951	1,196		
Centre,	1,261				
Chester,	1,302	947	1,267	1,127	1,200
Clinton,	1,461	1,200	1,505	933	1,083
Cumberland,	1,295	1,055			
Dauphin,	1,123	1,004	1,231	1,057	1,116
Delaware,	1,122				
Franklin,	891				
Huntingdon,	1,076				
Indiana,	679				
Juniata,	1,033	1,166	1,161	1,322	1,292
Lancaster,	1,409	1,007	1,567	1,126	1,323
Lebanon,	1,127	985	969	975	1,119
Lehigh,	1,150				
Luzerne,	1,232				
Lycoming,	1,454	1,069	859	1,109	1,343
Mifflin,	1,123				
Montgomery,	1,308				
Northumberland,	1,106	973	1,247	1,068	
Perry,	945				
Philadelphia,	942				
Potter,			1,059		
Snyder,	1,183				1,198
Tioga,	1,249	1,091	1,570	1,112	1,355
Union,	1,216				
Westmoreland,	1,150				
Wyoming,	1,139	1,270	1,157		
York,	1,260	1,099	1,323	1,024	1,239
State	1,340	1,074	1,495	1,106	1,261

The experience of the last few decades of agricultural production has amply illustrated the fact that local specialization in some particular product tends to develop special skill and standardization of the product. These increase its salability.

The history of the cigar tobacco industry in Pennsylvania shows no considerable development of organized marketing by the grower, nor of any brokerage system by which this product may be satisfactorily sold for the account of the seller. Instead, the buyer comes to the grower, with whom he deals individually. Under such conditions, the isolated producer of a few acres remote from the centers of production, has small marketing chance, even though his cultural success be of a high order.

CROP VALUES.

The values of the several decennial crops as set forth in successive Census reports, beginning with 1879, with the exception of that for 1889, for which no statement of value was made in the reports, were as follows:

Year.	Acreage.	Yield. Lbs. of cured leaf.	Value. For entire crop.	Per lb. cents.	Per acre.
1879	27,566	36,943,372	$ 4,636,380	12.55	$168.19
1889	26,955	28,966,247			
1899	27,750	41,502,620	2,959,304	7.13	106.64
1909	41,742	46,164,800	3,926,116	7.42	94.05
1919	42,799	55,965,851	10,073,852	18.00*	235.38

The prices per pound here stated are weighed prices; that is, they represent the average price for both first and second grades of leaf, the proportions by weight of the respective grades being taken into account. The large cash returns to the acre, and the fact that deliveries can be made at any convenient time in the winter, after Jan. 1st, help to explain the persistence and intensive development of this culture.

TYPES OF TOBACCO.

Pennsylvania Broadleaf is recognized in the trade as a cigar filler tobacco. Because of its texture, flavor, and aroma it is well adapted to this use. The venation of the Broadleaf is such that the side veins are drawn toward the tip of the leaf and branch out from the mid-rib at an acute angle. This means that when the leaf is finally bunched in the cigar, the small veins run lengthwise and do not interfere with the burn. This type of tobacco will mature from twelve to eighteen leaves. The leaves are from 12 to 16 inches wide and from 20 to 36 inches in length. A well shaped leaf carries its width well toward the tip of the leaf. The character of the plant is erect until after topping when the leaves are inclined to lay out. The most desirable strains of this type tend to hold the erect leaf habit as long as possible thus permitting late cultivation and showing a greater percentage of leaf surface to the sun. The cured leaf is chestnut brown on the top side with a more olive green shade on the bottom. The yield per acre ranges from 1500 to 2500 pounds.

Havana Seed is grown on the sand river bottom soils. The best of this is used for cigar and stogie wrappers and for cigar fillers. This type of plant is much more erect in habit of leaf growth than the Broadleaf. The plants mature from fourteen to eighteen leaves

*This 1919 price corresponds with the average obtained for that year by the Bureau of Statistics of the State Department of Agriculture. According to the local correspondents of the Bureau, the prices were not uniform throughout the State, (Crop and Livestock Report No. 53, Dec. 1, 1919). From Bradford and Tioga Counties, 23 cents was reported; from Clinton and Lycoming, 20 cents; from Lancaster, 18 cents; and for neighboring counties, 12 to 25 cents.

and yield from fourteen to twenty-one hundred pounds per acre. The cured leaf usually is reddish brown in color and thinner in body than the Broadleaf type.

CULTURAL METHODS

In order to produce a good crop of tobacco of uniform size, with large leaves of a glossy, dark green color it is not only necessary to supply the soil with fertility, but the seed must, like Caesar's wife, be above reproach. The inferiority of a large proportion of the tobacco produced in the long-established tobacco regions from native varieties may partly be attributed to deterioration of yield and quality due to lack of systematic and careful seed selection.

PREPARATION OF SEED.

The necessity of good, carefully selected seed from a vigorous strain is apparent when the difference of yield in strains of the same variety is found to be as high as 500 lbs. per acre, as shown by the Seedleaf Strain Tests conducted by the Pennsylvania State College Experiment Station at Ephrata, Landisville, and Willow Street. Furthermore, the seed must be cleaned and graded so that all light, immature seeds may be removed, for they produce weak, spindly plants which are an easy prey for various diseases, and which greatly reduce the yield. The cleaning and grading of the seed is easily done by a home-made seed separator, by the use of which tobacco seed for a whole community may be cleaned and graded in a short time. Tobacco growers have found that the first plants pulled from the seed beds usually did not develop very uniformly. This was found to be due to the fact that these plants were produced by weak, immature seed. It was found also that these seeds can be removed by means of an air current driven through a quantity of the seed. The first seed cleaning machine was devised by using an upright glass tube about 6 feet in length and closed at the bottom with a fine wire gauze. The seed was poured into the tube and a current of air forced through it by means of a foot bellows. The air current blew away the light immature seeds and the remaining heavier ones produced stronger and more uniform plants in the seed beds. Recently a more convenient machine operated with an electric fan has been devised and the seed can be cleaned very rapidly. Most of the growers are now having their seed cleaned each year.

It is customary in Lancaster County to "sprout" or induce partial or complete germination of the tobacco seed before seeding, accomplished by placing the seed in moist receptacles of various kinds. This practice is not to be recommended, because the sprouting is

usually done near a stove or other warm place, and when seeded the tender sprouts are liable to be injured by the frequent handling or by the sudden change from a warm place to the cold ground. Therefore, it is safest to sow the seed without any previous sprouting, though it may take a few days longer before the seeds germinate.

When germinating or sprouting the seed, it is tied up in a woolen cloth and immersed in lukewarm water for twelve hours. The cloth is then taken out of the water and the excess moisture drained off, whereupon the cloth is untied and spread out over a plate and covered with another plate inverted over it. The plate is kept in a room with a temperature of 80° Fahr., or more, for four or five days, when the seeds begin to sprout.

SEEDBEDS AND STERILIZATION.

The seed beds should be located near a convenient water supply, and also as near as possible to the field to be planted. A southern exposure is preferred, and also a position sheltered from the cold north winds. Seed beds in Pennsylvania are usually located in the gardens, so they can be utilized for vegetables after the transplanting of the tobacco plants.

The bed consists of a cold frame generally 6 feet wide and any length, made of 12-inch boards fastened to stakes, which are driven into the ground. The lower edge of the board is covered with dirt to exclude insects, and after seeding, cheese cloth or muslin is stretched over the upper edge and securely tacked down. Frequently the muslin is tacked on light frames, which have the advantage of being easily handled. Glass sashes also are used, mainly because they induce a more rapid growth. However, these require much attention and are less economical than muslin. In Clinton County it is the custom to cover the beds with piles of brush after the seeding, but muslin covers are gradually coming into use.

A heavy application of stable manure is applied to the soil when the beds are prepared, and in some localities hog or chicken manure is used. In the case of the latter, care should be taken not to use an excessive quantity. In the absence of manure, commercial fertilizers may safely be used, and the following formula is recommended: 1600 lbs. Cotton seed meal, 400 lbs. Acid phosphate, and 200 lbs. Sulphate of potash per acre; or, for a seed bed 6 feet by 70 feet, 12 lbs. Cotton seed meal, 3 lbs. Acid phosphate, and 2 lbs. Sulphate of Potash, though the potash may be omitted if not procurable. This fertilizer should be broadcasted over the bed after digging and raking, and should be carefully mixed with soil by means of repeated rakings. So-called comb dust also is an excellent fertilizer for tobacco seed beds, and is much used in Lancaster County, though usu-

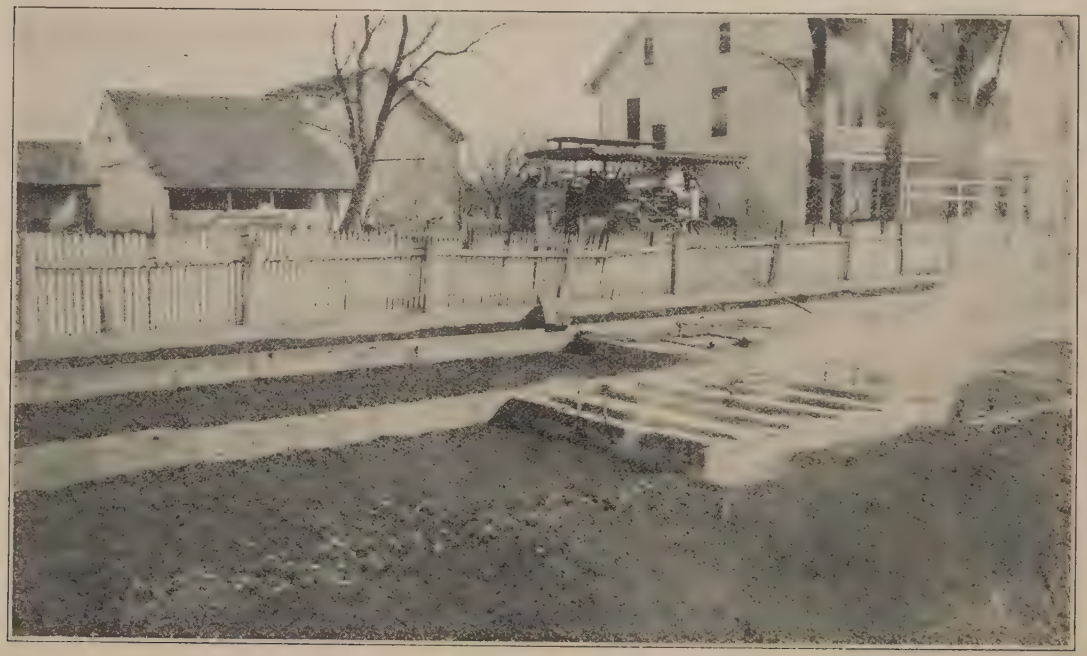

Fig. 4. Steam Sterilization of Seed Beds.

ally applied in small quantities over the bed after the plants have begun to grow.

Steam sterilization of seed beds is now generally practiced by progressive tobacco growers, for the purpose of destroying insects, weeds and detrimental organisms in the soil. This method consists of applying steam to the beds by means of an inverted pan. The pan is a shallow box, from 8 to 10 feet long and six feet wide, with a depth of from 4 to 6 inches; larger sizes being more difficult to handle. It is made of 16 to 18 gauge galvanized iron, supported by ribs of $1\frac{1}{2}$ inch angle bars. Other ribs of angle iron are run across the top, two in the middle and one on each edge, holding the pan rigid. A $\frac{3}{4}$ inch nipple is firmly secured by flanges and solder in the middle of one end for the hose connection. Ring bolts for handles are attached on the ends, and the pan rendered steam tight by riveting and soldering.

Before the steaming is started the bed should be manured, dug and raked just as if it were being prepared for seeding. The pan is then inverted over the section of bed to be sterilized and connection established with the boiler, by means of steam hose or pipes. The steam is turned on for a period of at least thirty minutes, whereupon the pan is lifted and moved to the section adjoining. The steam pressure should be at least 100 lbs., as high pressure steam has a greater penetrating power than low pressure. It is to be noted that clay soils need longer periods of steaming than sandy soils, also that wet soil is much harder to steam than dry soil. The temperatures of the soil in the upper two inches should be about 208° Fahr., just after the pan has been removed, and two hours afterward it should be about 160°. The efficiency of the steaming can be determined by burying a potato 4 inches under the surface of the soil. If it is well cooked when the pan is removed the steaming is well done. Immediately after the removal of the pan, the steamed sections should be covered with burlap, which serves to retain the heat of the soil. The seeding should not be done until the day following the steaming, because if sown soon afterward, the heat will kill the seeds.

For the first ten days after steaming there is a temporary injurious action in the soil which retards the growth of the plants when sprouted seed has been sown. If dry seed is sown, this injurious effect has disappeared by the time the seeds germinate, and is followed by a decidedly stimulating action, causing plants on steamed beds to be ready for transplanting ten to twelve days earlier than plants on beds not steamed.

The surface soil on steamed beds is apt to be dry and crumbly, and for this reason steamed beds require much more water than

others. It is important to remember this, and to inspect the beds during bright, clear, and windy weather.

The steam tractor owners in Lancaster County are supplied with two or more steaming pans, and the farmer is only required to furnish coal and water. It takes about 100 lbs. of coal per hour for a steam pressure of 100 pounds.

It is possible also to sterilize the soil by applying formaldehyde, but this method is not as practical and economical as the steaming process. It would be necessary also to apply the formaldehyde during the fall, as the great quantity of solution needed for a thorough sterilization would make the soil in the bed too wet, and delay seeding in the spring. One gallon of formaldehyde to 50 gallons of water, applied at the rate of 2 quarts per square foot by means of a sprinkling can, makes an efficient solution for sterilization.

CARE OF SEED BEDS. (Insects)

Undoubtedly one of the most efficient methods of seeding is to pour the seed into a sprinkling can full of water, stir well, and then sprinkle the water evenly over the bed. Another method consists of mixing the seed with several times its volume of sifted ashes, and sowing this evenly over the bed, afterward tamping or rolling the top soil lightly.

The rate of seeding is important, as an overcrowded stand causes weak and spindly plants with inferior root systems, while a thin stand may result in curtailment of acreage. One ounce of tobacco seed contains about 300,000 seeds, and if a germination of 75% is assumed 225,000 seeds will sprout and grow. As a result of experiments at Ephrata it was found that a stand of three plants to the square inch may be obtained by sowing the seeds at the rate of one ounce to 600 square feet, or one level tablespoon full to 150 square feet,

The beds are usually well watered after seeding, and the top soil covered with old sacks of muslin, which serves to retain the moisture and warmth. Hog bristles and straw are also used for this purpose, but require much more labor in applying and removing. After the top soil has been covered with ashes, muslin or muslin frames are put in place over the cold frame.

It is necessary to keep the beds moist, though not wet, until after complete germination, as failure to properly water the plants often results in a poor stand. On the other hand, too much water may favor fungous diseases. It is best, while watering, to remove the muslin which can easily be done if the muslin is tacked on frames, because when watering through the muslin the water collects in the center and seeps through, causing injury to the plants immediately

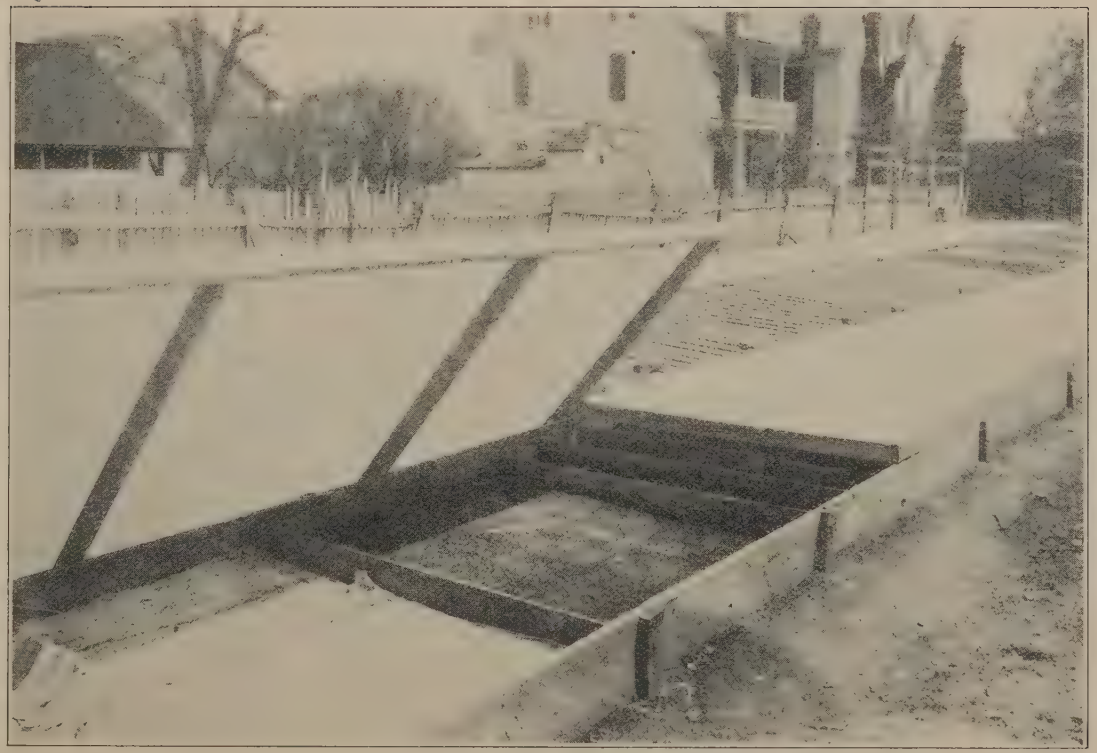

Fig. 5. Seed Bed Coverings—Cloth and Glass.

below. The bags or other covering on the top soil should be removed as soon as the plants begin to come up. Frequently mildewed spots may be present where this covering rested on the ground, but they will disappear on exposure to the sun. It is not necessary to water the beds so often after the plants are up, and beginning to grow, but the beds should never be allowed to become dry, as a certain amount of moisture is needed for the subsequent growth. The covers on top of the cold frame are taken off about one week to ten days before transplanting, in order to harden the plants to exposure.

Slugs or snails and earthworms frequently infest seed beds and damage the plants. A few applications of hydrated lime spread thinly over the bed in the evenings will drive these pests away, especially if one-fortieth part of powdered arsenate of lead is mixed with the lime. A light coat of soot is also effective, but both lime and soot should be washed off next morning, and neither should be applied if there is any indication of rain during the night.

The flea beetle attacks young plants, both in the seed bed and the field, causing considerable damage by riddling holes in the leaves and devouring new foliage. To destroy this insect, spray the bed with arsenate of lead at the rate of one pound of arsenate of lead in paste form, or one-half pound of powder, to 16 gallons of water. Mix thoroughly and apply to the bed until all plants are covered.

For plant lice and fleas the beds may be fumigated with nicotine punk, which is paper impregnated with nicotine. Ten square inches of nicotine punk is placed in a tin can punched full of holes and ignited, sufficient to fumigate 50 square yards of seed bed. The part of the bed being fumigated must be covered with a tarpaulin or other heavy material, to prevent escape of the fumes, unless it is covered with glass.

In case the growth of the plants is slow and irregular, or if they assume a yellowish color it usually indicates a need of plant food. One pound of nitrate of soda to five gallons of water sprinkled over a bed of 150 square feet every four or five days will soon remedy that condition which is caused by malnutrition. Liquid chicken manure is also very good for this purpose, but water must be applied freely after these applications, especially after the nitrate, or the plants will be ruined. Comb dust is more efficient than either, as it is more convenient to apply, and has the added advantage of not burning the plants.

Fig. 6. Seed Beds Containing Thousands of Plants Ready for Transplanting

FIELD PREPARATION.

Deep and careful plowing is a prime requisite in tobacco culture, and it has properly been stated that "most of the cultivation should be done before planting". While fall plowing is beneficial in several respects, notably in destroying cut worms, it has the disadvantage of the manure supply not being ready. This refers especially to Lancaster and York Counties, since little manure is used in the Clinton-Lycoming district, where fall plowing no doubt should prove suitable, though the use of cover crops would probably be even more beneficial, as the maintainance of humus is important to plant life.

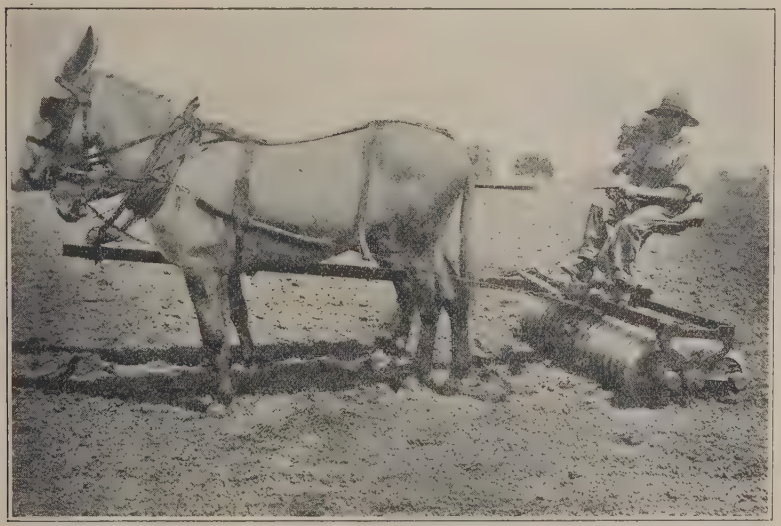

Fig. 7. Cultipacker. An Efficient Implement in the Preparation of the Field.

The plowing is usually done during May, and is followed by rolling and discing. The field is then dragged, which crushes the clods and pulverizes the soil. It is desirable to repeat the discing and dragging after heavy rains, so as to conserve the soil moisture and kill weeds, upon which the cut worms feed. If commercial fertilizers are to be used, they should be applied broadcast about ten days before transplanting, and thoroughly worked into the soil by discing. When the soil has been treated in this manner it is only necessary to loosen the surface of the soil by a light discing when ready to transplant, and to follow the discing with a plank or drag. The soil should not be worked if wet, as permanent injury will result. It is better to wait a few days.

The management of the soil in tobacco culture is of equal importance with the subsequent handling of the crop, and upon the care

bestowed upon the tobacco in cultivation and handling, depends the yield and quality of the crop. While the usually high state of fertility of the Pennsylvania soils requires constant cultivation in order to be preserved, the necessity of adding more plant food must not be overlooked because tobacco must have a rapid and uninterrupted growth for the production of a quality crop.

EQUIPMENT.

Among necessary articles for tobacco culture may be mentioned the plow, disc harrow, cultipacker, roller, drag, manure spreader, fertilizer distributor, transplanting machine, spring tooth harrows, cultivators, and hoeing machines.

Fig. 8. Tobacco Plant Ready To Be Transplanted.

PLANTING.

It is desirable to select large, strong and uniform plants in the seed bed, and to discard plants with poor root systems, which handicap their growth from the start, and result in much re-planting and uneven crops. The beds should always be watered thoroughly before the plants are pulled, so that the roots may be drawn up as intact as possible. The plants are placed in boxes or baskets, care being taken to keep the stems straight and the roots down, and away from the direct rays of the sun. After being filled with plants the containers are placed in a shady corner until needed in the field, but the plants should be set out as soon as possible after pulling, because if kept over twenty-four hours they become wilted and unfit for planting.

Very little, if any, transplanting by hand is done in Pennsylvania, the transplanting machine being used in all tobacco growing districts. This machine is drawn by two horses, and carries a driver and two other persons to set the plants, each person setting every alternate plant. There are several makes of this machine, but the one most generally used has a V-shaped plow which makes an opening into which the plant is set, and is held in place by the hand until the soil has been packed around the roots by means of a couple of paddle shaped blades which follow the plow and draw the soil up, slightly compacting it. By means of gearings on the wheels quantities of water are poured out at uniform distances, which may be regulated, and which indicate where the plant is to be set. Unless the plants, during dry weather, are set exactly where the water drops, they may perish, the stand will be uneven, and the resulting crop a mixture of ripe and unripe tobacco when harvested.

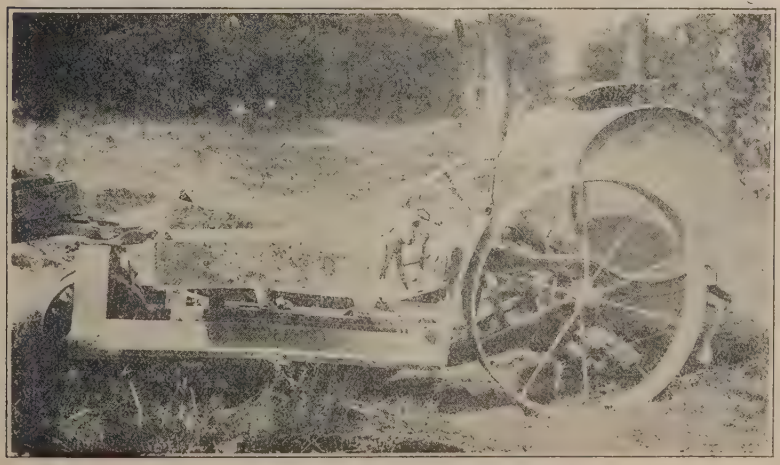

Fig. 9. Tobacco Transplanting Machine.

Careful growers always overhaul their transplanting machines previously so that they are in good working condition when needed. They should be carefully adjusted to the size of the plants and the condition of the soil.

When necessary to set the plants out by hand, the rows are marked by some means, and the plants set with a trowel, leaving the bud above ground. Care must be taken to have the roots placed straight in the holes made by the trowel, and to pack the dirt firmly around the plant. In dry weather some water should be put close to, but not on, the plant and dry soil raked over the wet spot so that caking will not result. In extreme dry weather holes may be made with a hoe handle, water poured into them and the plants set in the holes after the water is absorbed; dry soil being raked over the wet spot.

Every few days after transplanting, the field should be inspected, and all missing plants replaced with new ones. This should be repeated until the stand is as nearly perfect as possible. It does not pay, however, to delay the replanting too long, as this will result in an uneven stand of plants.

PLANTING DISTANCES.

Seedleaf tobacco is planted with the rows from 36 to 42 inches apart, while the usual distance for Havana seed is 36 inches. The distance at which the plants are set apart in the row varies considerably, from 20 to 32 inches for seedleaf and from 14 to 20 inches for Havana seed.

Extensive experiments at Landisville and Lock Haven have shown that both seedleaf and Havana seed tobacco produce a larger percentage of long leaves when planted with the rows three and a half feet apart than when planted with the rows three feet apart, also that the percentage of second grade leaves is smaller when the first named distance is used. The closer planting, however, increased the yield slightly because of the greater number of plants per acre.

Fig. 10. Tobacco Hoeing Machine in Operation.

CULTIVATION.

Cultivation begins shortly after the transplanting is finished as it is important to get the field in good tilth after the packing of the soil, caused by the transplanting. For this purpose a side harrow is run once through the rows. Later on the side harrow or cultivator is used going around the rows. The horse hoeing machine is being used quite generally. As a rule the field should be cultivated after heavy rains and in dry weather it is advisable to give the field a shallow cultivation fairly often in order to preserve soil moisture. In rainy weather it may be necessary to continue cultivation even after the tobacco is topped to keep the soil from packing, but the period of cultivation generally ceases when the leaves have become so large and spread out that a horse no longer can pass between the rows without damaging the plants. The aim of the grower should be to keep the soil mellow and soft, and this of course, also necessitates frequent hoeing; either by hand or machine or both. The tobacco plant is a surface grower, with few deep roots and the root system is rather small when compared to the large leaf surface. Most of the roots will be found in the upper soil and that is why shallow cultivation must be practiced after the plants have made some growth. During the first few weeks after transplanting, it may be advisable to cultivate deeply once or twice in case the soil has become packed and hard, but later on all cultivation must be shallow. Years ago farmers thought that fields should be cultivated only for the purpose of keeping down weeds, but now it is generally recognized that frequent cultivation aids in crop production by conserving moisture, aerating the soil, and making the plant food more easily available.

INSECTS.

Cut Worm. Cut worms cause much damage to tobacco by cutting off the young plants in the field, thereby necessitating much replanting, with resulting uneven stand. They may be found early in the mornings or on cloudy days by digging about a cut-off plant. A poisoned bran mash is very effective in getting rid of this troublesome pest, and is made as follows; one-half pound of Paris green mixed well with one bushel of bran, sweetened with molasses and with just

Fig. 11. Tobacco Horn Worm.

enough water added to make a crumbly mixture to be sown broadcast over the field after transplanting, care being taken to brush off any of the mixture that may have fallen on the tobacco plants. If the above mixture is thoroughly applied before planting very little trouble from cut worms should be experienced.

TOBACCO HORN WORM.

The damage caused by the tobacco worm seems to be increasing every year in Pennsylvania: doubtless owing to the fact that the growers rely almost entirely on hand picking as a means of combat, whereas more strenous practices would probably produce better results. It requires forty-five to forty-eight days to complete the life cycle of the horn worm, as follows: emerging of moth to oviposition, 4 days; incubation period 4 days; total larva, or worm period 19 days; pupal period 21 days. There are usually two generations during an average summer. The most effective way to destroy the horn worms is to get them while they are young by dusting the plants with arsenical poison by means of a dust gun. Contrary to general belief little if any of the poison remains on the tobacco when ready for manufacture, and what little remains is of such infinitesimal proportions that it is practically harmless. It has been found by experiments that arsenate of lead in powdered form, mixed with hydrated lime or fine sulfur, at the rate of one pound of arsenate of lead to five pounds of lime or sulfur, is more effective than Paris green, since it does not burn the leaves.

A moth trap, made of meshed wire, is frequently used in Lancaster County to catch the tobacco moth which lays the eggs of this worm. One or more of these traps are placed on the field, with a flowering plant underneath, which serves to attract the moths. Several hundred moths may be caught by a single trap during the season.

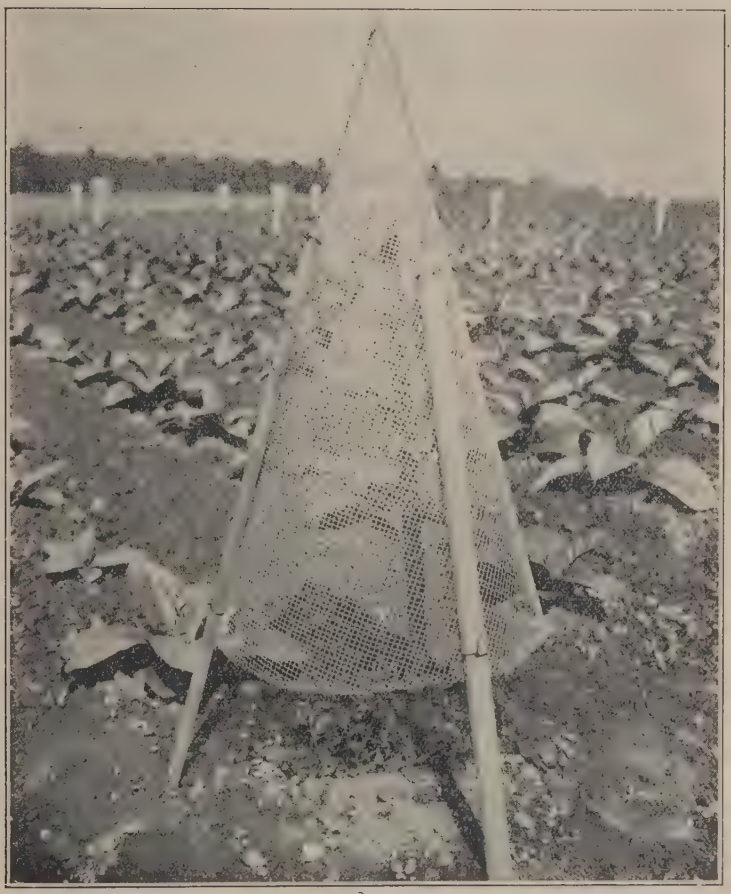

Fig. 12. Wire Trap Used To Catch the Moth of the Tobacco Worm.

FLEA BEETLE.

The flea beetle will frequently follow the plants from the seed bed to the field and may continue to injure the plants during an entire growing season. Dusting the plants with arsenical mixtures as described in the foregoing paragraphs will also prove detrimental to the flea beetle.

STINK BUG.

The stink bug or squash bug extracts the juices from leaves causing wilt and subsequently sunburn. These bugs are difficult to kill by contact poison but may be trapped by laying shingles or small

boards near the plants at frequent intervals where they will congregate and where they may be destroyed.

GRASSHOPPERS.

Sometimes considerable damage is caused by grasshoppers gnawing holes in the leaves when the tobacco field is situated near a grass field; especially after the grass has been cut. The best remedy would doubtless be a poison bran mash applied on the outside rows of the tobacco field, taking care not to put any of it on the grass or dusting as directed for the tobacco worm.

PLANT LICE.

Plant lice, or aphids, are nearly always present in a tobacco seed bed or a tobacco field and no attention is paid to them by the farmers. Recently, however, they are suspected of being carriers of the Mosaic disease, or calico, and the evidence against them is very strong. There are several kinds of aphids infecting the tobacco plant, which have been proven to be active disseminators of this disease. Fumigation with Nicotine Punk will destroy them in the seed bed but no efficient remedy has yet been devised for use in the field though perhaps a 5% nicotine solution might prove helpful.

Fig. 13. Mosaic or Calicoed Tobacco Plants. These Plants Were Infected When Small.

TOBACCO CRAMBUS.

This insect, often designated as tobacco wire worm bores into and feeds upon the stems of newly set plants. They are very difficult to control, owing to their inaccessible position. Domestic fowls will pick up the larva but deep plowing and discing when preparing the fields are more efficient.

TOBACCO BUDWORM.

The tobacco bud worm is the same insect as the corn ear worm; the tomato fruit worm and the boll worm of cotton. The moth of this worm lays its eggs in the buds of the plants and a single worm may eat through several leaves, rendering them worthless. They are not often found in Pennsylvania tobacco fields, but occasionally they may do some damage. Paris green mixed at the rate of one tablespoonful to one peck of sifted corn meal dusted into the bud will destroy the bud worm.

PLANT DISEASES.

MOSAIC.

The Mosaic disease is one of the most baffling of all diseases that affect the tobacco plant. It occurs wherever tobacco is grown and at all stages of growth. It has various local names such as calico, gray top, mottled top, brindle, mongrel, etc., all suggestive of the local manifestations of the disease. It is very infectious and is easily communicated from diseased to healthy plants by laborers in transplanting, topping, suckering, etc, or by insects. Once a plant is infected, it will not recover but neither does it die, though the yield of leaves will be greatly reduced and the quality inferior. The disease is believed to be caused by a very small germ and it is known to be spread by aphids. For control measures it is suggested that all infected plants be pulled up and burned; or otherwise destroyed and the hands washed with soap and water after handling diseased plants.

Fig 14. Mosaic or Calicoed Tobacco Plants.

FOXY TOBACCO.

Foxy, frenchy, or shooting star tobacco is often mistaken for Mosaic but this disease has different symptoms, such as narrow, thick and small leaves with numerous yellow spots. The leaves stand up in an erect manner, like the ears of a fox. In severe cases the leaves are very long and narrow and extremely thick and brittle. This disease is due to malnutrition and is not infectious. Unfavorable soil conditions, due to defective drainage, are also a frequent cause of this disease.

ROOT ROT.

Root rot is a blackening and gradual decay of the roots of the tobacco plant; caused by a fungus known as Thielavia Basicola which lives as a parasite on the roots. In the absence of tobacco it attacks cowpeas, clover and other legumes and has been known to exist on dead organic material in the soil from five to ten years. Hence, it can readily be seen that crop rotation does not wholly prevent root rot, though it no doubt checks the disease to some extent. It was first reported as having been noted in Pennsylvania in 1884, by Killebrew, and is known to exist wherever tobacco is grown. It has been found that low temperatures are favorable to the development of the disease and that high temperatures check it. It is usually developed in the seed bed and scattered over the adjoining fields by transplanting, farming implements, wind, etc.

Sterilization of seed beds, either with steam or formaldehyde, will effectually kill this organism but sterilization of an entire field is not practicable. It has been found, however, that there is a marked difference in the susceptibility of plants to root rot, even within the same variety, and it is supposed that by careful breeding of resistant strains the disease may be rendered less dangerous.

LEAF SPOT DISEASES.

Leaf spots, which are variously called "Frog Eye", Brown Rust, Red Rust, Wildfire, Blight, etc. are due to germs which attack the leaf only under certain conditions, that ordinarily do not often occur. Factors concerned in bringing about outbreaks of these spots are fertility of soil, fertilizers used, weather conditions, and the maturity of the crop. Leaf spot is never serious except as a result of wet weather. An abundant supply of ammonia in the soil or fertilizer predisposes tobacco to injury. Low topping also may result in leaf spot, since the relative amount of ammonia is thereby increased. Potash is of some value in reducing injury, but must be supplemented by the application of less ammonia in the fertilizer and by higher topping.

Fig. 15. Tobacco Blossoms. The Center Cluster Is Ready for Bagging To Prevent Cross-fertilization.

SEED SELECTION.

The desirability of a more general knowledge concerning the laws governing heredity is undeniable and it is unfortunate that the lack of space forbids a more extended discussion. It is only of late years that the tobacco growers of Pennsylvania have realized the importance of carefully bred tobacco seed, the general practice being to select some seed stalks in an out-of-the way corner in the field, the selection being based more on that supposed convenience than on any excellence of the plants selected.

A careful tobacco grower will pick out plants of good, uniform growth, basing his selection on points of superiority over other plants, such as greater number of leaves per stalk, larger width, length, and better shape of leaves, small size of veins, greater length of stalks, larger internode, or space between leaves on the stalk, small extent of heel, or area of leaf at the place of attachment between leaf and stalk, and early maturity. He will make his final selection just before the plant flowers and mark the stalks he wishes to save for seed, noting the size and numbers of suckers and discarding plants showing a strong sucker growth. Just before the first flower opens he will remove all shoots except the central prongs and as many of the upper leaves as he would have removed if the plant had been topped. He then places a 25lb. Manila bag, if it is Seedleaf, or a 12 lb. bag if it is Havana seed, over the flower head, punching a few holes in the bag with his pen knife to admit air, and ties the bag securely but loosely so it can be moved up as the stalk grows.

The purpose of bagging the flower head is to prevent insects from cross-fertilizing the flowers with pollen from other possible inferior plants, and by forcing the plant to pollinate itself, will in all probability transmit its characteristics to the next generation. It is advisable to inspect the bags occasionally so that suckers and dead corallas may be removed. The bags should also be pushed up from time to time because when the flower head meets the resistance of the top of the bag it is forced to grow downward, which may prevent proper pollination.

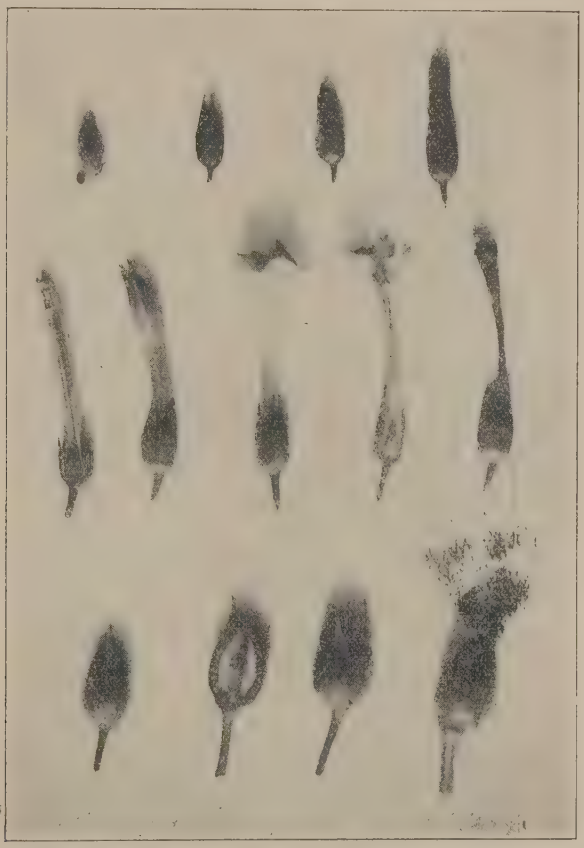

Fig. 16. Bud, Blossom and Seed. Stages of Development from the Tobacco Seed Bud to the Ripened Pod.

TOPPING.

By topping is meant the removal of the flower bud of the tobacco plant. The object in doing this is to force the nutritive substances

of the plant to remain in the leaves because, when the plant is allowed to flower the nourishment is gradually diverted or transferred from the leaves and used for the formation and production of seed.

HEIGHT OF TOPPING.

The height to which tobacco should be topped is determined by several factors, the chief ones being the purpose for which the tobacco is to be used and the amount of plant food in the soil. Moisture and weather conditions and differences in growth and maturity are also to be considered. In fact, no hard and fast rules can be laid down as to how high tobacco should be topped but must be left to the

Fig. 17. Topping Tobacco.

judgment of the grower. In general, however, good vigorous plants of seedleaf tobacco on well fertilized soil may be topped to leave 14 to 16 leaves on the stalk provided the season is normal. Havana seed tobacco, which is mainly used for binder purposes should, under

the same conditions, be topped to leave about sixteen leaves on the stalk, which would aid in producing thinner tobacco, while seedleaf, being used mostly for cigar fillers, should have a heavier bodied leaf. During dry weather, or if the tobacco is lacking in plant food, the stalks should be topped lower, in extreme cases as low as twelve leaves, so that the upper leaves may develop properly. Too low topping of vigorous strains has a tendency to cause coarse textured tobacco and it greatly reduces the yield, as proved by experiments at Landisville and Lock Haven. During wet seasons low topped tobacco may be subject to rust or other leaf spots.

TIME OF TOPPING.

Topping arrests the growth of the stalk to a great extent and if the plant is topped before the bud appears the distance between the leaves on the upper part of the stalk will be less than if topped just before the first flower opens. This fact has some bearing on the growth and successful curing of the tobacco because, by later topping a greater distance between leaves on the stalk is secured. Extensive experiments indicated that the stalk continues to grow even after the first flower appears and that the portion bearing the eighth to the fifteenth leaf makes the greatest increase in length. A distinct increase of the distance between the leaves occurs after the appearance of the first bud. Topping appears to arrest the growth of the plant and effects to the greatest extent the portion bearing the eighth to the fifteenth leaf.

In topping tobacco, great care should be exercised not to injure the tender leaves or to leave a large portion of the stalk sticking up above the top leaves. Unless a uniform strain of tobacco is grown the plants will not develop flower buds at the same time so that in order to secure an even ripening, it may be necessary to top some plants lower than others, instead of going over the field several times.

EFFECT ON FUTURE PLANT DEVELOPMENT.

The changes in the plant resulting from topping are most noticeable in the top leaves, which grow to almost the same size as the middle leaves. Later the bottom leaves shrink and turn yellow; the lowest leaves wither and die away, or remain as shreds, while the middle leaves begin to take on a somewhat lighter color. The upper leaves ripen last, as the ripening process progresses from the lowest leaf upwards.

SUCKERING.

Soon after topping, suckers, or lateral branches, begin to grow as a result of the efforts of the plant to reproduce itself. They usually

appear first on the upper part of the stalk, in the axils of the leaves and later on the middle and lower leaves. If broken off, others appear during the life of the plant. The suckers are usually removed twice but for the sake of better quality and increased yield it is advisable to remove them oftener, because they usurp the vitality of the plant and divert it from the leaves. These facts were conclusively proven at the experiment field at Lock Haven, where two plats were planted with Connecticut Broadleaf in order to demonstrate the value of suckering tobacco. The plats received identical treatment except that one plat was suckered three times and the other was not suckered until just before harvest. The result was a difference in yield of 330 lbs. per acre in favor of the suckered plat. The difference in quality in favor of the suckered plat was even greater than the difference in yield.

RIPENING.

IMPORTANCE OF RIPENING.

Pennsylvania tobacco, which is commonly used for cigar filler and binder purposes should be allowed to stand until thoroughly ripe because, if harvested prematurely, its color will be dull and its quality inferior. This point cannot be impressed upon the tobacco growers too strongly because every year there are numbers of crops in Pennsylvania harvested before the tobacco is ripe and soon after topping, mostly because of ungrounded fears of frost. The frost damage has been greatly exaggerated and does not cause a thousandth part as much damage as lack of fertilization and careless handling; but if the thermometer drops a few points during early September, the tobacco growers become worried and begin to cut their crops regardless of the stage of ripeness, thereby losing far more than they would by a light frost.

HARVESTING.

CUTTING.

Pennsylvania tobacco is harvested by cutting the stalk near the ground with long-handled shears, as in Lancaster and York Counties, or with corn cutters, as in Clinton and Lycoming Counties. The shears are superior for this purpose as the stalk can be cut close to the ground without injuring any of the leaves, besides being easier to handle and allowing quicker work.

Fig. 18. Harvesting. The Tobacco Plants Are First Cut Down and Allowed To Wilt.

IMPLEMENTS.

Necessary implements for harvesting are long-handled shears, iron pointed tobacco spears, one or more tobacco ladders, or frames fitted upon wagons, on which the tobacco laths are hauled to the curing shed, and 1000 laths per acre for seedleaf and 1200 per acre for Havana seed. The laths are four feet long, one and a half inches wide, and one-half inch thick.

TIME OF DAY.

Tobacco should not be cut until the dew has dried off the leaves in the morning. Foggy showery weather is to be avoided if possible as it prevents proper wilting.

WILTING AND SUNBURN.

After cutting, the stalks are left lying in rows until wilted by the action of the sun so that the leaves can be handled without breaking. Care must be taken that the wilting is not protracted too long, as there may be damage from sunburn in that case, indicated by dark brown spots on exposed leaves.

SPEARING.

When wilted sufficiently, the stalks are grasped at the butt end and strung on the lath by means of a detachable iron spear fitted on one end of the lath, putting five to six stalks of seedleaf per lath and eight to ten of Havana seed. Care should be taken not to thrust the spear through any leaves.

SCAFFOLDING.

It is customary among many of the tobacco growers in Lancaster County to hang the tobacco laths after spearing upon portable racks, known as "scaffolds", for a few days after harvesting, the object being to bring the tobacco to such a wilted condition that it can safely be hung close in the curing shed, thus saving space.

Fig. 19. Harvesting in Lancaster County, Showing Method of Spearing Plants, Field Racks or Scaffolds, and Ladders for Hauling to the Shed.

Fig. 20. Seed Saved for the County Tobacco Growers' Association.

HAULING.

After being speared the tobacco is then hung on the wagon and conveyed to the curing shed, unless scaffolded when the hauling takes place a few days later, usually during early morning when there is no work in the field. In some parts of York County, the tobacco laths are hauled to the sheds in flat wagons, being piled up high.

PRIMING.

Another method of harvesting tobacco, principally cigar wrapper and binder leaves, known as priming may be of some interest, though not used to any extent in Pennsylvania. It consists of picking the leaves from the stalks as they ripen, placing them in baskets and carrying the baskets to the shed, where the leaves are laid on long tables. Here, by means of a large needle, a string is passed through the stem at its base, one end of the string being attached to the end of a lath, and when the string is full, the free end attached to the other end of the lath. Each lath should carry 36 to 40 leaves and the leaves should be put on in pairs, so that they are back to back and face to face. The laths should be spaced five inches apart on the poles in the curing shed.

CARE OF SEED STALKS.

The leaves of the seed stalks should be primed. After harvesting, in case the field must be seeded, the seed stalks may be carefully dug

up, care being taken to keep as many of the roots as possible and removed to a trench made along the side of the field, or other suitable place, where the stalks may stand until all the pods have turned brown. The bags may be taken off when the pods have filled out. When the pods have turned brown, the seed heads should be cut off and placed under shelter for drying but they must be kept out of the way of mice and rats, which seem to have an unexplainable fondness for tobacco seed.

Fig. 21. Good Type of Seed Stalk. Capped with a Paper Bag To Prevent the Cross-fertilization of Blossoms by Insects.

TOBACCO CURING.

The finished tobacco ready for making the cigar, differs much from the ripened leaf as it is harvested. The latter is full of moisture and, if dried rapidly in an oven, remains green in color, is brittle, hard to burn, and in its slow combustion, yields a smoke of very unpleasant quality and a dark, muddy ash. The changes that take place in the leaf tissues so that the clear brown color, fine aroma, relatively acceptable flavor and excellent burn are developed, result from two sets of conditions; one prevailing while the leaf cells are slowly dying, the other after their death.

Fig. 22. Tobacco Curing Shed with Bottom, Horizontal Side, and Roof Ventilators.

The ripe leaf is green in color, owing to the chlorophyl present in its living cells; it is richly laden with starch and much of its nitrogen is present in highly complex forms, proteins, corresponding to the white of egg in complexity. These compounds form in the leaf when it is exposed to the energy of the sun. At night, they tend to break down, liberating the energy the leaf cells required to maintain their life in the dark, that is, these substances act as reserve substances. In the darkness of the curing shed, the plant cells, as long as they keep alive, exhibit the same series of changes which the leaves of the growing plant show at night. The starch breaks down, sugars decompose; after that the proteins show some measure of splitting up and the green color of the surface cells disappears, allowing the yellow leaf color, which it has previously masked, to become apparent. In general, the process is one of slow starvation, probably with min-

or effects upon constituents other than those already mentioned. Meanwhile, also, there is a more or less rapid loss of the leaf moisture.

If the destruction of the starch is not affected and also a very considerable start in the destruction of the green coloring matter is not made before the leaf cells die, the forces that work during the later stages of curing can not accomplish these two things and the leaf is left imperfect for its uses.

Fig. 23. Modern Type of Curing Shed without Stripping Cellar.

As the most conspicuous change apparent in the first stage of the curing is that from the green to the yellow color, so the second stage is marked by the development of a brown color. In a good cure, this color change appears first at the leaf tip and on its edges and progresses toward the rib and from the rib to the stalk. Its appearance indicates the death of the leaf cells in the region affected.

This browning is not a lip process but is due to oxidation changes wrought by the oxygen of the air upon the dead tissues, and its development is determined not alone by the freedom of air access to the tissues affected, but also by the prevailing temperature and moisture conditions. Simultaneous with the color change occur other chemical changes chiefly effecting the less complex materials existing or formed during the first curing stage. The substances determining flavor and aroma are developed in part during the second stage. In a general way, the changes occurring during the second stage of the cure are like those of the subsequent 'fermentation' or 'sweat'.

Since the ultimate values of the finished leaf depend much upon the perfection of the sweat and since the control of the process is far better in the packing house than in the curing shed, it is desirable that the second stage of the cure shall not proceed too far. Tobacco that has been 'cold sweated' in the cure can rarely be gotten into a good sweat afterward so the finish is left very imperfect.

To effect the changes of the first stage the leaves must be held at temperatures favoring cell activity and under such moisture control as will prevent sudden drying, but permit a slow decrease in the amount of leaf moisture. Leaf cells become very inactive at a temperature as low as 40° F., and are killed by a heat of 125° F. Temperatures of 60° to 70° F. favor suitably rapid change and a humidity of the air immediately surrounding the curing leaves equal to 85% of its highest water-holding capacity at the temperature there existing, permits the slow escape of moisture from the leaves.

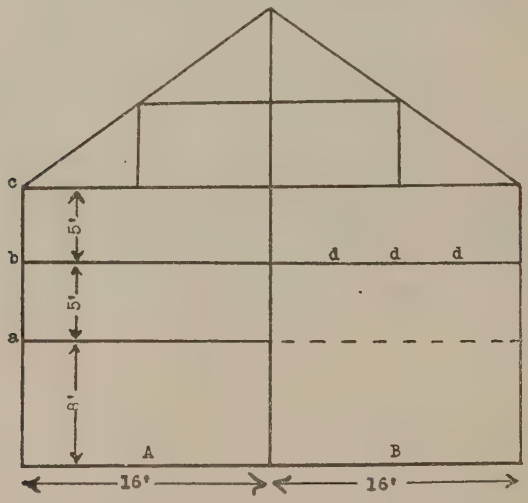

Diagram 1. Curing Shed. Cross-section of frame, end view. A & B - Bents. a, b & c - Tiers. Dotted line - Removable girder. d - Ends of cross-poles. Driveway through B.

During the second stage, the reduction of the leaf moisture may advantageously be made more rapid, until first the nib, then the ribs and finally the stalk have become safely dry. In fact, if the humidity of the air is too high just after the yellowing stage has been fully reached, very serious losses from the disease pole burn may occur. Too high moisture at later times during the second stage of curing may induce also white vein, rib-rot, and leaf stain. For the curing in the second stage, a relative humidity of 80%, later of 65—70% is desirable.

The process by which Pennsylvania cigar tobaccos are cured is known as air-curing. It includes no use of artificial heat, as now practiced, but depends entirely upon very imperfect ventilation devices.

In essence, the curing shed consists of two parts, a frame-work upon which the tobacco is hung and a surrounding shelter or case containing the ventilators. The relative dimensions of the frame-work are based upon the length of the individual laths upon which the tobacco is strung in the field, namely, four feet. Usually the frame-work is made up of horizontal posts and cross-beams or girders, upon which, in turn, are laid cross-poles, sixteen feet long, either squared or round. Upon these cross-poles the laths laden with the tobacco stalks are hung.

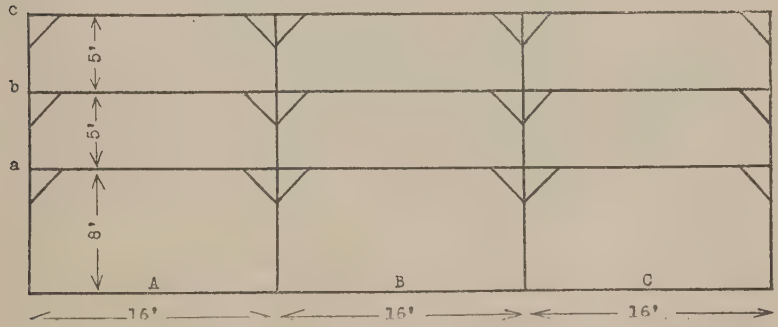

Diagram 2. Curing Shed. Cross-section of frame, side view. A & B - Bents. a, b & c - Tiers. Dotted line - Removable girder. d - Ends of cross-poles. Driveway through B.

Each bent, or vertical section, is divided into three or four horizontal tiers, each suspending a single length of the tobacco stalks. A height of three tiers to the plate or the square affords a better control of ventilation and, hence, of curing, than a four-tier arrangement. A vertical height of five feet should be allowed for the cigar-leaf tobaccos harvested on the stalk. Usually this will allow a few inches of clear space between the bulk of the tobacco on a lower tier and the leaf-tips of the tobacco on the next higher tier. The tips of the tobacco on the lowermost tier should hang at least three feet above the ground floor. This requires that the supporting girders for the lowest tier shall be placed eight feet above the floor and those of the higher tiers at vertical intervals of five feet. A three-tier shed will run eighteen feet from floor to plate or square. The shed is given a steeply sloping roof and the frame-work is extended above the square so that tobacco may be hung to fill the space between the square and the peak. The shed should not be made more than two sections or thirty-two feet wide but it may be as many sections long as the

acreage planted may require. The general arrangement of the frame is shown in Diagrams 1 and 2.

The main frame-work (posts, plates and beams) is built of stout timber, usually 7″ x 7″, sometimes heavier, because it must bear the weight of at least 4500 stalks corresponding to a load of 20,000 pounds of the freshly harvested tobacco.

The girders in the upper part of the frame-work are permanently fixed and well braced; but those of the lower tier, at least on one side of the shed, should be removable so that a driveway can be made and the tobacco laths be passed directly from the wagon-rack to the workman or workmen employed in hanging the tobacco in the shed. The latter is filled first from peak to square, and then throughout the upper tiers and the lowest tier on the closed side. Finally, the clip-girders and cross-poles of the lowest tier on the open half are put into place and filled with tobacco, bent by bent, until the whole shed is filled. If, for any reason, the usual acreage is exceeded, the excess number of plants may be cared for in the mows of the hay barn. Should the acreage be less than usual, the tobacco should be so hung as to fill, from side to side, and from lowest tier to peak, as much of the length of shed as may be needed.

The walls and roof of the shed with their appliances form the case. The cuts shown show some of the more common varieties of ventilating arrangements. All curing sheds have ventilators on their long sides, sometimes horizontally arranged, sometimes vertically. Often too, those provided with vertiele ventilators have their posts and sills supported on brick, masonry or concrete piers, a foot or more

Fig. 24. Landscape in Bradford County Showing the Type of Curing Sheds Used in This District.

in height. In such case, a horizontal ventilator is frequently hung from the sill, so as to open outward and permit the air to enter at floor level. The more modern sheds often have metal ventilators set along the ridge-pole and provided with valves or dampers controllable by cords worked from the floor.

Fig. 25. This Building Is Used as a Curing Barn in the Fall and as a Warehouse in Winter.

It must be clear that these structures afford only a very clumsy apparatus for controlling the air-movements uniformly throughout all parts of the closely hung frame-work. If, as in too many cases, the walls are loosely boarded so that numerous crevices remain open at all times to the passage of the winds, the control of interior conditions is hereby much reduced.

The shed should be so located in an open space that one long side is well exposed to the prevailing wind; on level ground or at least so that the floor shall be level and a loaded wagon be easily backed into it; and not far from the farm-house, so that close attention may readily be given to it during the curing period.

STRIPPING.

ESSENTIAL MOISTURE CONDITION.

The tobacco when fully cured is very dry and brittle and cannot be handled unless the atmosphere is damp, which imparts a pliable condition to the leaves. While it is desirable to wait for a protracted period of wet weather before taking down the tobacco laths from the poles, it is frequently necessary to take them down as soon as the tobacco can be handled without breaking. When taking down tobacco from the poles the laths should be placed on the floor in a five sided pile, with the butts of the stalks facing out and the tips of the leaves

in, taking care to fold the leaves neatly inside the pile. When stacked in this way, the tobacco retains its moisture for a considerable period, especially if the pile is covered with old sacks, corn stalks, etc.

If the tobacco in the pile is so dry that it cannot be handled without crumbling the leaves, it may be sprinkled slightly with lukewarm water before being put in the dampening cellar, but the greatest care must be exercised in this matter. A little too much water may result in "black rot" after the tobacco is put in cases because tobacco that feels dry in cold weather will be found to be quite damp when brought into a warm room. Therefore, it is safest to err on the dry side and use no water on the tobacco; but if absolutely necessary to use it, the laths must be hung on tier poles before the water is sprinkled over the butts, so that the surplus moisture may drain off. Tobacco should never be placed on the floor when being sprinkled. The tobacco may then be hung in the cellar, with the laths placed quite close together. It may take 36 hours or more until the leaves are soft and pliable and the tobacco should be watched closely while in the cellar and promptly removed if becoming too damp.

The dampening cellar and stripping room are usually located under the south or east end of the curing shed and may extend under the entire structure. For convenience in handing down the laths, a trap door connects the dampening cellar with the floor of the shed above.

Fig. 26. Sizing Tobacco Leaves in the Stripping Room.

The stripping room is adjacent to the cellar, though usually the floor of the cellar is several feet lower. The cellar is generally whitewashed and both cellar and stripping room should be kept scrupulously clean, to avoid fungous troubles and mildew. The stripping room contains tables for sorting and sizing the tobacco leaves, a rack for piling the stripped stalks, sizing boxes and the baling press. In Clinton and Lycoming Counties, a casing press is used, as the tobacco there is not baled, as in Lancaster and York Counties but is packed in cases. A stove also is a necessary adjunct.

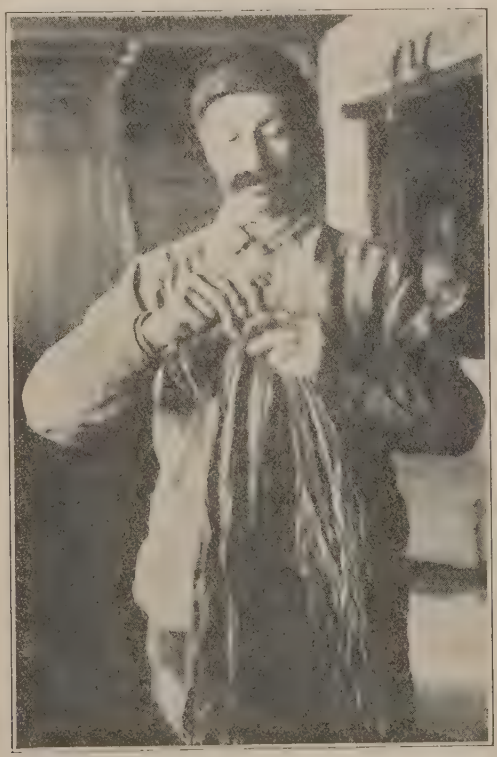

Fig. 27. Tying a Hand of Tobacco.

REMOVING LEAVES FROM STALKS.

In the case of seedleaf tobacco then, as soon as the leaves are soft and pliable the laths are brought from the cellar to the stripping room and placed on the table, whereupon the stalks are pulled off the laths. The trashy bottom leaves, which are called "scraps" are removed and the lowest leaves on the stalks, together with any leaves higher up on the stalk which may be badly broken, worm eaten or

otherwise damaged. This grade of tobacco is called "filler". The scraps are placed in a convenient box under the table and the fillers are tied up in "hands." All the remaining leaves, which are sound and whole, are removed and are termed "wrappers". The terms fillers and wrappers do not imply that these grades are to be used as such but merely indicate the difference in quality. In fact, both these grades are used for the same purpose; namely: cigar filler tobacco, though an occasional crop of seedleaf tobacco may contain some leaves suitable for binder purposes. The stalks, after being stripped, are placed on the rack until a load is accumulated when they are carried outside and neatly stacked in piles. The empty laths are tied in bundles of one hundred.

SORTING.

The wrappers are then sorted as to lengths by being placed in sizing boxes graded from twelve to thirty-four inches, each leaf put in the box that corresponds to its length. It is important to handle the leaves carefully, to lay them down straight in the grading boxes, and to size them right. Recently even the fillers are sorted as to length.

TYING INTO HANDS.

The leaves of the same length are then tied into hands of about twelve to fourteen leaves of wrappers and fourteen to eighteen leaves of fillers, by neatly and evenly wrapping a folded leaf of the filler grade near the butt end. It is advisable to use the greatest care in

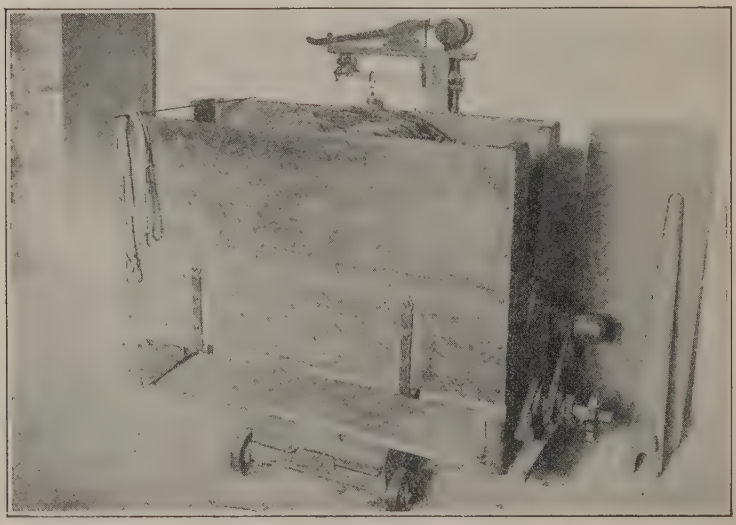

Fig. 28. Press Used for Baling Tobacco in the Stripping Cellar. The Scales Are Used in Order to Make the Bales of Uniform Weight.

this work, which aids greatly in the subsequent appearance of the crop. The tied hands are then placed carefully in piles, the fillers being kept separate from the wrappers until there is enough accumulated of either grade to make a bale.

BALING—PACKING CASES.

The baling press is a box with collapsible sides, fitted with a removable attachment worked with a lever for pressing the bales. Heavy paper, cut previously to fit one-half of the bale, is then placed in the press and the tobacco packed in layers, the butt ends of the hands outward and the tips of the leaves overlapping in the center of the box, extreme care being taken to lay the hands down straight, without doubling or folding the leaves. The bales should weigh from 50 to 70 lbs. and when the required number of pounds are packed, another piece of paper is placed on top of the tobacco; the top board placed over it and the lever worked until the bale has been pressed down moderately, whereupon the collapsible sides are removed and the bale tied with three hemp twines passed by means of a large needle through openings in the press. The top board is then laid aside and the bale removed.

While Havana seed tobacco in Clinton County is handled in a similar manner while being stripped, the procedure in grading and packing is different. Havana seed tobacco is sorted into fillers, binders and wrappers. The fillers consist of the lowest leaves on the stalk, as well as all sandy and otherwise damaged leaves. The binders are all sound leaves, discolored, or heavy bodied, while wrappers are all sound leaves of a more thin, silky texture and light color. After being graded the tobacco is sized into hands and packed in cases, about 300 lbs. to the case. The cases are then stored in the lofts of the stripping room until sold.

CARE OF BALED TOBACCO.

After baling the tobacco, the bales are removed to some well ventilated place, usually on the floor of the curing shed, in tiers not more than two bales deep. Tobacco bales should never be stored in a cellar or stripping room, where damage is likely to result from mildew or heating.

Fig. 29. Shipping Day at a Railroad Station in the Tobacco District.

MARKETING.

UNSWEATED IN BALES.

Tobacco in Lancaster, York and adjoining Counties has, during the past few years, usually been sold while still hanging in the curing shed. The buyers appear on the premises and make their offers of so many cents per pound for fillers, wrappers and scraps, the crop to be delivered to the buyer's warehouse as soon as stripped and baled. The contract usually stipulates that the tobacco shall be free from damage when delivered. Less frequently the tobacco is sold by samples from the bales. While this method of buying tobacco by visiting the farms where it is grown should tend to encourage the sale of tobacco strictly on its merits, such is not the case, unfortunately. The large tobacco companies, when ready to buy, send out whole scores of buyers, each one having instructions to cover a certain district and to buy out the crops in that district, regardless of quality. This method of buying discourages the farmer from taking any special care of his crop and he reasons that it does not pay. However, it is not generally recognized that the grower who uses plenty of plant food and takes pains to handle his crop with

care, receives more pay for his crop because the careful grower gets a better yield, has less trashy stuff in the crop and helps to maintain the good reputation of Pennsylvania tobacco.

SWEATED IN CASES.

Discouraged by the uncertain market conditions some tobacco growers pack their tobacco in cases, or engage some packer to do it for them, at so much per pound, storing the cases to undergo the sweating process. This usually requires about a year, though it takes much less time when the bulk sweating method is employed. When sweated, the cases are sampled and the tobacco sold on the strength of the sample. The growers rarely resort to packing the tobacco themselves, however, because of the cost and the delay in receiving returns from their crops. Besides, tobacco loses from 10 to 15% of its weight after undergoing the sweating process.

Fig. 30. Sizing the Tobacco Hands According to Length.

COOPERATIVE PACKING.

The cooperative Packing movement of late years has received an unprecedented stimulus, due partly to lower prices and partly to a general and widespread interest in cooperative movements of all kinds.

The tobacco growers in Lancaster County have taken the initiative in organizing packing associations in Pennsylvania, and there are at present four of these working in different parts of the county, namely, Mount Joy, Lititz, Ephrata and Mountville.

The Mount Joy Company is the pioneer in this movement, having been organized in the spring of 1919 by a number of public-spirited farmers. The other companies are conducted along similar lines so that a short description of the business methods of the Mount Joy Company will serve to show how the system works. The grower brings his crop to be packed, for which he contracts to pay two cents per pound, to cover cost of packing and insurance. His crop is kept separate from others, and a U. S. Warehouse receipt issued to him, which he may use as security for a loan at the bank if he so wishes. The crop at all times is the property of the grower, and is sold only when he is satisfied with the price offered to the company by the buyer. When the crop is sold the warehouse charge is deducted by the Company, and the net proceeds returned to the grower.

At the end of the first season the records showed that growers who availed themselves of this cooperative packing had gained five cents per pound over and above what they would have received if their crops had been sold to individual buyers. It is stated that this cooperative effort had what might be termed a moral effect on the community, as prices generally were a few cents higher per pound.

The four companies have recently formed a central association in order to correlate efforts in marketing and cooperative buying.

Fig. 31. Placing the Tobacco in a Bulk for Sweating.

SWEATING AND AGING.

BULK SWEATING.

After being delivered to the warehouses the tobacco bales are opened and the hands carefully shaken to open the leaves and remove dirt. The hands are then graded as to size on long tables, all hands of the same length being kept together and packed in bulks for a preliminary sweat, or fermentation process which is essential to all cigar leaf tobacco. The bulk is built on a platform slightly raised from the floor, from ten to twelve feet long and six feet wide, with head-boards on each end, to aid in building the bulk and to keep the tobacco from slipping. The hands are then laid in rows on the platform, which has previously been covered with paper, as close together as possible, with the butts facing outwards. The succeeding rows are interlapping, which makes the bulk slightly higher in the center. It is then built up, layer by layer, until about five feet high and then covered with rubber sheets. Within a few days the temperature of the tobacco begins to rise. The exact degree of heat should be ascertained by means of a thermometer inserted in the middle of the bulk through a tube but more generally the fingers of the packer are used to feel the heat. The sweat is allowed to proceed until the heat reaches about 140°, when the tobacco is packed in the cases, after being shaken vigorously. The cases are then pressed, nailed up and stored until the following summer, when they are sampled and sold.

Fig. 32. Packing the Tobacco into Cases.

Some packers continue the bulk sweating by tearing up and rebuilding the bulk. This is done by taking off the top layers and laying them aside. The inside layers from the old bulk are then used for outside layers on the new bulk and vice versa. The top and bottom layers from the old bulk are placed in the middle of the new bulk, the object of the reversal of the inside and the outside layers being to secure a uniform sweat.

The bulk heats up slowly after each subsequent turning and is allowed to stand longer. It is then packed in cases, which are stacked three to four high, where the tobacco undergoes the aging process.

CASE SWEATING.

Before the practice of bulk sweating was introduced in Pennsylvania through the experimental work, it was the custom to "case sweat" tobacco, and this method is still followed by some packers, though very hazardous and uncertain, as well as inefficient. Case sweating consists of packing the tobacco upon delivery from the farms to the warehouse in wooden cases, built very substantially and holding from 300 to 400 pounds. These have one inch spaces between the end boards in order to allow the surplus moisture to escape. The inside of the case, except the ends, is covered with heavy paper and the tobacco is packed with the buttends toward the outside. A frame is placed on top of the case so as to enable the spongy tobacco to be pressed in, by means of a larger press, after which the lid is nailed on and the case marked with number, weight of case and gross weight. This is known as marked weight and is considerably more than the actual weight after fermentation, as tobacco loses from 12 to 15% of its weight during the sweating and aging processes. The cases are then stored in rows three or four cases high and the tobacco commences to sweat. Sometimes artificial heat is used to force the sweat, but more often the tobacco sweats through the heat of the sun during the summer months, which is known as "natural sweat".

It is clear that this method of sweating tobacco is largely a matter of guess work and the packer is unable to find out how the sweat is progressing inside the cases. Very frequently the packer finds, on sampling his cases, that great quantities of tobacco are damaged by "black rot" or "green mould" or both. In contrast, bulk sweating allows the packer to determine the exact status of the tobacco at any time and can apply remedies if there is danger of damage. All in all, bulk sweating is a much surer, safer and quicker way to sweat tobacco.

PACKING HOUSE CONDITIONS.

The packing houses, of which there are several in each town in York, Lancaster and adjoining counties, present their greatest activity during the late winter and spring months, when the tobacco is being delivered. Large numbers of laborers are then busily engaged in preparing the tobacco to be packed in bulks or cases for the sweat. After the packing is finished, usually in May, and the cases piled up to undergo the aging process, the packing houses are closed, unless there is some "black rot" tobacco to pick out from the sound leaves. The sampling, which is usually done during the early fall months, also presents a scene of great activity.

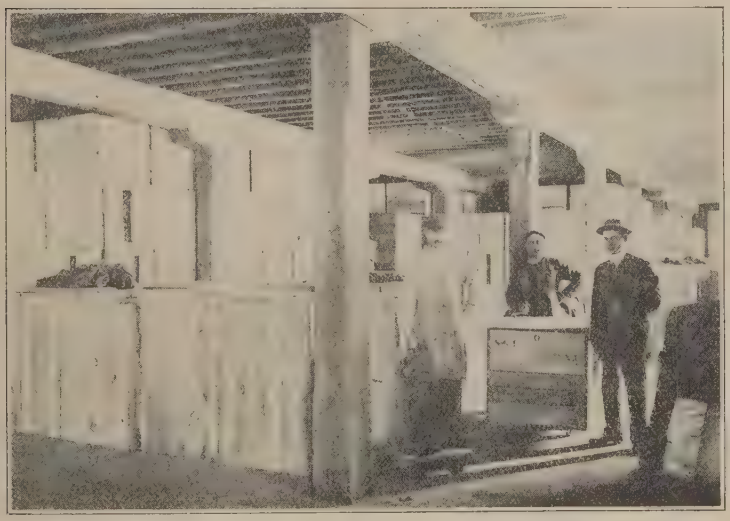

Fig. 33. Cased Tobacco in Sweat in the Warehouse.

SAMPLING.

Pennsylvania tobacco is sold exclusively by sample, when ready for the jobber, or manufacturer. This work is usually performed by sworn samplers, who guarantee that the sample under their seal represents the true condition of the tobacco in the case from which it was drawn. When sampling tobacco, after it has passed through the sweating and aging processes, the lid is taken off, the case turned over and gently lifted off the tobacco which sticks together. Samples are then pulled from several places in the mass, the tobacco examined and its condition noted, whereupon the case is slid back over the tobacco and the lid nailed on. The sample is numbered corresponding to the number on the case and a seal affixed.

STANDARDIZATION.

Under the U. S. Warehouse Act any individual, corporation, partnership, or any two or more persons having a common interest may upon written application to the Secretary of Agriculture, Washington, D. C., obtain a license for the conduct of a bonded tobacco warehouse, provided certain regulations, such as suitability of warehouse, solvency and competency of warehouseman, etc., are complied with. Authority to issue warehouse receipts is then conferred. These embody the name of the warehouseman; license number of warehouse; date of expiration of the license; amount of bond; identification number for each package or case of tobacco; statement whether tobacco is insured by the warehouseman; etc., Also whenever the form, grade, or condition is required to be or is stated it shall be in accordance with the following regulations:

"Until such time as official standards of the United States are in effect, the form, grade, or condition of tobacco shall be stated as far as applicable either in accordance with standards adopted by any tobacco organization or by the tobacco trade generally, or in accordance with any standards approved for the purpose."

Under the provisions of this Act the tobacco standardization work is conducted in Pennsylvania by the Bureau of Agricultural Economics, U. S. Department of Agriculture, in cooperation with the Bureau of Markets, Pennsylvania Department of Agriculture. Tentative grade lengths have been established, and constructive plans for formulating grades are now being considered. An undertaking of this kind requires an exhaustive and thorough-going study of conditions affecting the tobacco industry involving endless work, and it is only fair to state that the tobacco trade as a whole has not only endorsed the work, but also is actively cooperating in it.

MANUFACTURING.

CIGAR AND STOGIE MANUFACTURE.

It may be of interest to know the derivation of the word cigar. It is an abbreviation of the Spanish word cigarral, or garden. It was named thus because when tobacco was first brought to Spain it was usually grown in the gardens and the leaves after curing rolled into something roughly resembling the modern cigar. Stogie is an abbreviation of Conestoga, a river in Lancaster County from whence the Conestoga wagon derived its name. These elongated cigars first were made in Lancaster County and were carried far and wide on the Conestoga wagons. Pittsbugh and Wheeling, W. V., are now the centers of the stogie trade, while a very large percentage are

made in Lancaster County, which forms a part of the 9th Internal Revenue District.

Cigar leaf tobacco, as bought by the manufacturer, requires considerable rehandling before it can be made into cigars. The seed-leaf tobacco, to be used for cigar filler, must be resweated, so as to remove any harsh, pungent taste, which may still remain after the first sweating and the aging. The large cigar making concerns do this work in their own factories but the smaller concerns usually send their tobacco cases to some commercial company specializing in the resweating of tobacco. When resweating tobacco, the cases are opened, the tobacco taken out and the butt end of the hands dipped in water. After the water has drained off, the tobacco is packed in the case again. The cases are then placed in large rooms, heated by coils of steam pipes where the temperature and moisture conditions are easily controlled. Here the tobacco remains sweating, until, in the opinion of the operator, it has reached the proper stage for manufacture, when the cases are returned with the tobacco, usually in a dry condition. In the cigar factory it is brought into the necessary moist condition, or "case", by being dipped into water, or subjected to a fine spray. Some cigar manufacturers have their own secret formulas of various liquids added to the water, in order to impart some desired flavor to the tobacco. After the dipping or spraying of the tobacco the hands are shaken and set upright on a draining board to permit the surplus liquid to drain off. The pile is then covered with a moist cloth and allowed to stand until the droplets of moisture on the surface of the leaf have been absorbed. In a few hours the tobacco becomes soft and pliable, when the midribs are removed, either by machine or by hand, which operation is known as "stripping". While being stripped the separate halves of the leaf are "booked" or placed on top of each other, like the leaves of a book. The booked leaves are then placed on wire racks which are stacked in a drying room until the tobacco is at the proper stage of dryness. It is then carried to the cigar makers tables where it is broken into the proper lengths for the kind of cigars for which it is intended, by the "bunch makers" and a binder leaf wrapped over it, whereupon it is fitted into the molds, which are of numerous shapes and sizes, named variously Perfecto, Clubhouse, Londres, Panatela, etc. After receiving the impress of the mold the cigar is clothed in its overcoat, or wrapper. The cigar maker rolls the wrapper tightly on the cigar, the rolling proceeding from the open end toward the head, or enclosed end, the last portion of the wrapper remaining free being a small flap which serves to finish off the head. The open end is cut off so that it presents an even surface and the cigar rolled with some pressure

of the hand over the table, thus giving it the desired regularity of form. The freshly made cigars are sorted according to colors and tied in bundles. In this condition each cigar is round and when the prescribed number are being placed in the boxes by the packer they are overfilled, so that the lids must be brought into shape by pressure. Here the moist cigars yield to each other and assume such flattened angles and sides as may be required to get the box closed. The boxes are then sealed with revenue stamps and the manufacturers brand. Of late, owing to the shortage of lumber suitable for the manufacture of cigar boxes, round tin cans are used increasingly as cigar containers.

This brief description gives only a faint idea of the numerous processes which are necessary in cigar production and which vary considerably, especially among the larger concerns, where the use of machinery is increasing every year. Bunch making machines and suction tables are used successfully and the tendency to make the cigar a machine made product is becoming greater.

The extent of the cigar manufacturing industry in Pennsylvania may be judged by the following facts. At the close of the year 1918, 1,962 cigar factories were in operation in Pennsylvania. The number of cigars, weighing more than 3 lbs. per thousand, made in Pennsylvania in 1918 was 1,865,223,674.

LABOR IN CIGAR MANUFACTURING.

No statistics of labor engaged in the cigar manufacturing industry have been compiled since 1914. The next publication of such data will doubtless be as part of the new census material. However, the U. S. Department of Labor, in its monthly Labor Review, March 1920, has compiled wages and hours of labor in the cigar industry and though there has been a general increase of wages, amounting to more than 20%, since the survey was made, during 1919, an excerpt of this compilation is appended. This excerpt shows wages and hours in Lancaster only, as more nearly approaching the average, since wages in the larger cities are somewhat higher and in the smaller towns approximately lower.

WAGES AND HOURS OF LABOR IN THE CIGAR INDUSTRY, LANCASTER, PENNA.

	Weekly Wages	*Weekly Hours*	*Daily Hours*
Stemmers, Hand, Female, ...	9.38	48	8
Casers, Male, ...	$16.56	52.3	8.7
Stemmers, Machine, Female, ..	10.43	38.7	6.5
Bunch Makers, Male, ...	19.50	49.7	8.2
Bunch Makers, Female, ...	17.61	45.7	7.6
Bunch Makers, Machine, Female,	20.43	49.2	8.2
Cigar Makers, Male, ...	17.52	48.1	8
Cigar Makers, Female, ...	15.72	45.5	7.6
Rollers, Hand, Female, ...	15.41	50.2	8.4
Rollers, Suction, Female, ...	15.57	44.5	7.4
Banders, Female, ...	10.37	48.9	8.2
Packers, Male, ...	16.87	45.6	7.6
Packers, Female, ...	12.71	39.1	6.6
All occupations, Male, ...	20.84	46.9	7.8
All occupations, Female, ...	15.54	45.2	7.5
Male and Female, ...	17.17	45.7	7.6

In many cigar factories the hours of work are very irregular, the employees coming and going as they please. For that reason the average weekly earnings were obtained by dividing the aggregate weekly earnings of all employes in the occupation by the number of employees engaged in it.

USE OF PENNSYLVANIA TOBACCO.

The largest part of tobacco produced in Pennsylvania is used for cigar filler purposes, being mainly grown in Lancaster and adjoining counties. The Pennsylvania seedleaf tobacco suitable for fillers is noted for its aroma, taste and burn, and has become a standard filler, not only because of its dependability in these respects but also because the amount produced every year varies very little, so that the manufacturer can continue brands of cigars containing this filler and some brands of these cigars are world famous.

The Havana seed tobacco produced in Pennsylvania is used mainly for stogie wrapper and binder purposes, having superseded the seedleaf in this respect because it makes a smoother, better looking stogie. It is grown in the Clinton-Lycoming district and to a smaller extent in Tioga, Bradford and Lancaster Counties. This tobacco also possesses a good aroma and flavor and some of the better grades are frequently used for cigar wrappers.

CIGAR FILLER.

Nearly all cigars made in Pennsylvania contain seedleaf tobacco as a filler, though it may be variously blended with Havana, Java, Zimmer Spanish, Little Dutch, Gebhart, etc. In the best tobacco for cigar filler purposes the leaves are somewhat heavy, but not leathery, the lengths being from 16 to 25 inches, larger sizes being less desirable. A good filler is characterized by its rich aroma and

good flavor, the color being dark brown or a rich golden brown. The main essential, however, in fillers, as in all cigar tobaccos, is good burning qualities, which include ability to hold fire; freedom from coaling and charring, and coherency of ash.

CIGAR BINDER.

The purpose of the binder is to hold the filler in shape and to blend its flavor with the filler, producing a harmonious result. It must burn well, since frequently it is called upon to perform that duty for a poor burning filler. The heat generated by a burning cigar has been found to be 700 to 900° Fahr., and though it seems as if this heat would burn anything, fillers may be found that successfully resist even this enormous heat.

STOGIE WRAPPER.

The wrapper is the outside covering of a cigar, as its name implies. It should possess proper color, which according to the present fashion is light, though the color of the wrapper has nothing to do with the strength of a cigar, the popular notion to this effect being a misconception because the strength of a cigar depends mostly on the filler. A good wrapper should also have proper size and shape, fineness of veins, a good "grain" or small protuberances on the leaf and excellent burn with a coherent ash that does not flake and should be free from objectionable flavor and taste. While these points are not always to be found in a stogie wrapper, they are indispensable for other cigars. Stogie wrappers are mostly obtained from Havana seed tobacco, less frequently from seedleaf.

FARMING SYSTEMS.

ROTATION SYSTEMS.

In the districts where tobacco is grown in connection with other crops three general rotation systems are followed. These may be mentioned as three, four, and five year rotations.

Three Year Rotation—Tobacco, wheat, grass.

In this rotation tobacco is grown in sod ground. Alfalfa is very frequently used in connection with timothy and clover thus providing an excellent qualtity of hay and a good sod to be plowed under every third year. Manure and acid phosphate applied to the tobacco is the general fertilizing system followed. A part of the sod ground is usually put into corn.

Four Year Rotation—Tobacco, wheat, grass, corn.

This is the most commonly practiced rotation in the Lancaster district. In this case the tobacco is grown in corn stubble ground. If available manure is applied to both the tobacco and corn.

Five Year Rotation—Tobacco, wheat, grass, grass, corn.

This rotation is practiced in sections where there are large farms. The fertilization is similar to that in the four year rotation except in some cases a top dressing is applied for the second year's grass.

FEEDING OF LIVESTOCK.

In the Lancaster district the feeding of steers is a part of the farming system. All of the hay, corn and the straw is utilized on the farm and quantities of concentrates purchased in addition. Lancaster County feeds from sixty-five to eighty thousand head of steers each year. This means an average of between seven and eight head per farm. This system of farming is one which will conserve the soil fertility because it is using over and over again the plant food material of the crops which were grown on the farm and, instead of being sold and carried away, is retained in the manure. Large quantities of cotton-seed meal, oil meal, bran, and corn are purchased. The feeding of these concentrates produces a manure very well adapted to tobacco growing.

To a limited degree dairying is practiced under the same farming system as steer feeding.

SEASONAL DISTRIBUTION OF LABOR.

A study of the rotations and considering the labor in connection with the feeding of steers during the winter months shows a remarkably good seasonal distribution of labor. The following is a labor calendar of a tobacco farm under the livestock system as outlined:

April—Work on seed beds. Steer feeding.
May—Soil preparation for tobacco and corn. Seed bed care. Corn planting.
June—Tobacco planting. Corn cultivation. Hay making.
July—Tobacco and corn cultivation. Wheat harvest.
August—Tobacco cultivation, topping and suckering.
September—Tobacco suckering and harvesting.
October Tobacco curing. Wheat soil preparation and sowing. Corn harvesting.
November—Tobacco curing. Corn husking. Steer feeding.
December—Tobacco stripping. Steer Feeding.

January—Tobacco stripping. Steer Feeding.
February—Tobacco stripping. Steer Feeding.
March—Tobacco stripping and delivering. Steer Feeding.

This system enables the farmer to hire much of his labor by the year, rather than for a short period during the rush season in summer. This factor when covering a long period of years on thousands of farms becomes of considerable importance in the development of an agricultural district.

CONTINUOUS CROPPING SYSTEM.

On river bottom sections where a rather limited area of land well adapted is available a continuous cropping system is employed. This calls for very careful attention to the problem of soil fertility. Purchased manure, tobacco ribs and commercial fertilizers must be depended upon. To a limited degree cover crops of rye or vetch are used.

USE OF FERTILIZER.

In the areas where continuous cropping is followed the use of complete tobacco fertilizers is more general. The tobacco stalks and midribs are applied whenever available. Sometimes the stalks are shredded and applied as a top dressing for grass fields. Wherever complete fertilizers are used the sulphate form of potash is insisted upon.

TENANT CONTRACTS.

The tenant systems are of two forms, one where the tenant operates the entire farm on the share basis and the other where the tenant is simply a "cropper" and grows only tobacco. In the former case the land owner receives one-half of the value of the crop and the tenant furnishes all the fertilizer and labor. Usually special inducements are given by the owner to encourage the tenant to maintain a maximum number of livestock.

Under the cropping system the owner furnishes the land, the curing shed space, the manure, sometimes half of any additional fertilizer applied, and prepares the soil for planting. The tenant furnishes the plants, all of the hand labor, (using the owners horses and equipment) and the paper and twine used in stripping. The owner and tenant share equally in the sale value of the crop. This system has additional value in the fact that it attaches the cropper to the farm and his services are frequently available for other labor.

HAIL INSURANCE.

A growing tobacco crop can be insured against hail injury at a rate of about seven and one-half per cent of the face value of the

policy. The maximum per acre is usually $125.00. Under a tenant system the cost of insurance is shared by both co-operating parties.

FINANCING.

The Grower. In the cattle feeding districts most of the feeders are purchased during October and November. These cattle are purchased on the Lancaster yards and bought for cash. To finance this the farmer frequently borrows the money at his local bank on a short time loan covering five or six months. His tobacco is delivered during February or March and the note for cattle can then be retired. A survey showed that the banks of Lancaster County Advance to the farmers no less than $2,000,000 annually for the purchase of feeders.

The Packer. When the grower delivers tobacco to the warehouse he receives cash payment from the packer. A normal crop of tobacco is delivered into the packers' hands during February and March and will usually be through the sweat, and sampled ready for sale, by the following September or October. This means that the packer ties up his money for only a part of the year. He, therefore, finds it desirable to borrow from the banks to finance this industry. This can safely be done because the tobacco when received at the warehouse is fully covered by insurance and in this manner the bank is protected.

There are crops of tobacco occasionally, however, which do not sweat out in one season and in such cases the packer must carry it over for a longer period. The survey above mentioned shows that credit to the amount of nearly $3,000,000 is advanced anually to local packers by the Lancaster Banks. Additional loans amounting to nearly $900,000 also are extended to outside Firms making purchases in the County.

Fig. 34. Corn Usually Precedes the Tobacco Crop in the Lancaster County Rotation.

Fig. 35. Wheat. An Essential Part of the Lancaster County Crop Rotation

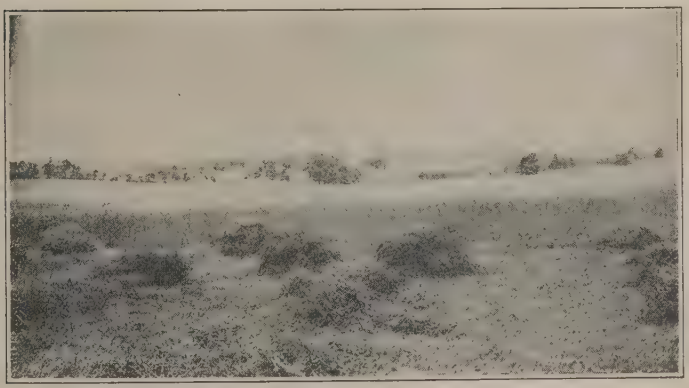

Fig. 36. Hay grown in the Rotation with Tobacco.

Fig. 37. Steer Feeding Is Practiced on Practically All Lancaster County Tobacco Farms.

Fig. 38. Field of Pennsylvania Broadleaf Showing Bagged Steel Stalks.

TOBACCO GROWERS' ASSOCIATIONS.

Lancaster County.

The Lancaster County Tobacco Grower's Association was formed in 1892 at the suggestion of Capt. John Bricker, of Lititz, by 200 tobacco growers, who elected the following officers: President, Capt. John Bricker, Vice President, Martin H. Greider, of Mount Joy, Secretary, A. S. Hershey, Lancaster, Treasurer, A. H. Summy, Manheim.

Membership is restricted to farmers and friends of farmers, and the objects of the Association, according to its constitution and by-laws, are to secure equity and fair dealing in all the business relations of the farmers, foster the growth of cigar leaf tobacco in the State of Pennsylvania, maintain closer relations among its members, promote uniformity in the customs and usuages of growing, curing and handling the crop for the market, inculcate principles of equity and justice in all the departments of the industry, investigate and disseminate valuable information pertaining to the culture and curing of tobacco, secure such legislation as may be beneficial to the interests of the cigar leaf tobacco trade of the State, and, if found feasible, establish experimental stations, and take such action as shall protect the growers from the competition of foreign grown tobacco.

Proceedings were at once started to obtain appropriations for experimental tobacco work, and experimental stations were instituted the following year in Donegal township and at Rocky Springs.

The acreage of Havana seed being greater at that time than that of seedleaf, five acres of Havana seed being grown to one of seedleaf, recommendations were made to increase seedleaf culture as being more suitable for Lancaster county soils, with the result that today practically the entire acreage of Lancaster County is devoted to seedleaf.

The association was instrumental in urging Congress to retain the tax on imported tobacco in 1893. Seedleaf tobacco was then being sold at ten and Havana seed at seven cents per pound. As an interesting sidelight on how fashions change in the tobacco business it may be mentioned that during a meeting in 1893 the members of the Association were instructed how to apply a certain liquid to the leaves so as to produce spots on them.

Committees were sent to Washington in 1902 to protest to Congress against any change of tariff. The exhibit of the Association at the Worlds Fair in St. Louis received highest honors, a gold medal for wrappers and a silver medal for fillers.

The Association protested against the reduction of the Philippine tariff by sending a petition signed by 3500 tobacco growers to Con-

gress. Strong protests also were made in 1909 against free import of Philippine tobacco and cigars. In 1911 the Association assisted the National Cigar Leaf Association to combat the Tobacco Trust. In 1913 a committee was sent to Washington to protest against any reduction of the tariff.

In 1919 the Association sponsored a movement to start a farmers organization to buy, pack and sell tobacco, which is in successful operation.

The membership is at present over 300, representing over 1000 tobacco growers, and fully one third of the acreage in the county.

As a part of the program at the monthly meetings, crop reports are given by members from the various townships, so that a fair idea of crop conditions are obtained. It is then the Secretary's duty to give a resume of crop and trade conditions in the United States. Prominent agricultural or scientific workers are then called upon to deliver lectures or addresses regarding points of common interest, followed by a general discussion. During the summer excursions are made to tobacco fields, and the owners requested to state methods employed in crop production. Field Days are held at the experiment stations and the various experiments explained by the men in charge.

The work of the Association has attracted attention from tobacco growers in all parts of the world and inquiries are constantly made regarding its Constitution and By-Laws, and methods of work.

Among the men who should receive recognition are B. Ezra Herr, J. Aldus Herr, Hon. W. W. Greist, M. L. Greider, and Frank Diffenderfer.

CLINTON COUNTY.

The Clinton County Tobacco Growers' Association was organized in 1912. The experimental work was begun on the Island this same year. The general plan and program of this association is similar to that of Lancaster County. Auto tours to see Clinton and Lancaster Counties have been conducted during the growing season.

YORK COUNTY.

The York County Tobacco Grower's Association is very similar to the organizations in Clinton and Lancaster Counties.

LANCASTER LEAF TOBACCO BOARD OF TRADE.

The Lancaster Leaf Tobacco Board of Trade was organized in 1900, and at the present time has a membership of sixty.

The results obtained from this organization have been to bring the tobacco dealers in closer touch, to eliminate misunderstandings

between dealers and farmers and to put the tobacco business of the country on a higher and better plane. Its aims are to continue work along these lines.

This organization is the largest of its kind outside of the city of New York. Many of its members are interested in the growing of, as well as in the dealing in Lancaster County Tobacco, and its chief object is to make Pennsylvania Fillers the finest produced in the country.

RESEARCH

U. S. DEPARTMENT OF AGRICULTURE.

PENNSYLVANIA STATE COLLEGE EXPERIMENT STATION.

Statement of Work Conducted.

One of the first substantial improvements in the tobacco industry of the State accomplished by the U. S. Department of Agriculture was the introduction of the bulk method in fermenting leaf tobacco. This work was begun in 1900 and during the winter of 1900-01 several million pounds of Lancaster County leaf were successfully fermented in bulk under the direction of the Division of Soils of the Department. This method, which greatly reduces the amount of damage from black rot, has come into wide use in the State. Since 1912 the Office of Tobacco Investigations, Bureau of Plant Industry, has actively cooperated with the State College Experiment Station and the above-mentioned tobacco growers' associations in investigations designed to aid the industry by ascertaining the most effective methods of handling the seed bed, fertilizing the soil, cultivating, topping and suckering the plant, controlling pole burn and other diseases in curing, and by the development of improved strains of tobacco through breeding and selection. In this work consideration has been given to improvement of the crop as far as practicable in both yield and quality with a view to increase the returns to the grower and at the same time more fully meet trade requirements. It will not be necessary at this point to undertake a detailed outline of these cooperative activities since they are sufficiently covered in the preceding section presenting the work of the State College Experiment Station. It will suffice to touch briefly upon two phases not included in the preceding section.

As a part of the study on the relation of fertilizer usage and other features of culture to the burning qualities of the leaf some important results were obtained as to the nature of the "grain" particles of the leaf, the conditions under which these particles are formed and their relation to the burning qualities of tobacco. It was found that failure of the grain-forming material to aggregate into well-

defined particles, because of unfavorable conditions, is an important cause of poor burning qualities. As a special phase of a more general study, experiments have been undertaken the purpose of which is the development of a seedleaf filler type for the Lancaster district which would be characterized by a lower content of nicotine than is found in the present domestic types of cigar filler tobacco. There appears to be a certain demand for a distinctively mild cigar and the experiment has been undertaken with a view to meet this demand. This investigation has not yet been completed.

In addition to the work which has been conducted in the State and dealing specifically with its tobacco industry, extensive investigations touching upon various phases of tobacco production have been conducted in Washington and in the principal tobacco-producing sections of the country, all of which directly or indirectly, are of more or less significance and value to the tobacco industry in Pennsylvania. Among these investigations may be mentioned extensive studies on the principles and methods of plant breeding applicable to the development of new and improved types of tobacco; the effects of soil, climate, fertilizers and other factors on the growth of the tobacco plant and the commercial quality of the leaf produced; the causes of poor results in curing and other methods of applying artificial heat to insure favorable conditions for curing; the causes of black rot, must and mould, and methods of controlling these troubles, with special reference to proper regulation of moisture; the nature of the fermentation process and its proper regulation for best results; the relation of the chemical composition of the tobacco leaf to its burning qualities and other properties of importance commercially; and the causes and the control of the various diseases affecting tobacco in the field and in the subsequent handling. One of the aims of the work in Pennsylvania is to introduce and to apply locally such of the results of these investigations as conditions may require and to ascertain what modifications of methods are required in applying these results to the solution of local problems.

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